Rubiacearum Americanarum Magna Hama Pars XXVI: New Species of *Hoffmannia* (Hamelieae) and More Comments on the Genus

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ABSTRACT. Species of *Hoffmannia* Sw. (Rubiaceae, Hamelieae) are concentrated in premontane and montane areas of Central America and southern Mexico and are notably variable morphologically, but are here treated as less variable than some previous authors have concluded. In particular, corolla shape and color and fruit shape are here considered species-level characteristics, and leaf shape and inflorescence size and position are considered less variable than previously posited. Fourteen species new to science have been discovered by recent exploration in Central and South America and are described here. One group of species includes *Hoffmannia* plants from Nicaragua, Costa Rica, Panama, and northwestern Colombia with paired ant vesicles (i.e., formicaria) at the base of each leaf blade. These plants have recently been all included in one species, *H. vesiculifera* Standl., but two other previously described species are recognized here, *H. morii* Dwyer and *H. kirkbridei* Dwyer, along with five newly described species and all the *Hoffmannia* species with ant vesicles are keyed here. The newly described *Hoffmannia* species with ant vesicles on their leaves are: *H. formicaria* C. M. Taylor of Costa Rica and western Panama, which differs from *H. morii* by its pedunculate inflorescences, pedicellate flowers, and white, greenish yellow, or pink corollas; *H. limonensis* C. M. Taylor of Costa Rica and western Panama, which differs from *H. vesiculifera* by its corollas with the acute to acuminate lobes longer than the tube; *H. pseudovesiculifera* C. M. Taylor of western Panama, which differs from *H. vesiculifera* by its scorpioid inflorescences and corollas with the lobes longer than the tube and in general unusually long within the genus; *H. subcapitata* C. M. Taylor of Costa Rica, which differs from *H. kirkbridei* by its shorter petioles, subcapitate pedunculate inflorescences, and longer broader calyx lobes; and *H. veraguensis* C. M. Taylor of western Panama, which differs from *H. formicaria* by its shorter calyx lobes and smaller corollas. The remaining *Hoffmannia* species newly described here lack ant vesicles on the leaves: *H. barbillana* C. M. Taylor of Costa Rica differs from *H. longipetiolata* Pol. in its sessile leaves that are rounded at the base and its epiphytic habit; *H. boliviana* C. M. Taylor of Bolivia and Peru differs from *H. obovata* (Ruiz & Pav.) Standl., *H. latifolia* (Bartl. ex DC.) Kuntze, and *H. pearcei* Rusby in its longer petioles, broader leaves, and smaller flowers; *H. coriacea* C. M. Taylor of central Peru is distinguished within *Hoffmannia* by its narrow leathery leaves and corolla with the tube longer than the lobes; *H. costaricensis* C. M. Taylor of Costa Rica differs from *H. valerioi* Standl. in its shorter calyx lobes and oblanceolate leaves; *H. micrantha* C. M. Taylor of Costa Rica differs from *H. hammelii* C. M. Taylor by its orange, brown, or purple corollas that are acute in bud; *H. pacifica* C. M. Taylor of Costa Rica is distinguished from *H. hammelii* by its subsessile leaves that are rounded to cordulate at the base; *H. rivalis* C. M. Taylor of lowland Peru is distinguished by its rheophytic habit, densely pubescent stems, narrow leaves, and small flowers; *H. tilaranensis* C. M. Taylor of Costa Rica differs from *H. nicotianifolia* (M. Martens & Galeotti) L. O. Williams in its larger red to purple flowers and larger leaves; and *H. turrialbana* C. M. Taylor of Costa Rica is distinguished from *H. pittieri* Standl. by its subsessile leaves that are truncate to cordulate at the base and have numerous secondary veins plus its few-flowered racemiform inflorescences.

RESUMEN. Las especies de *Hoffmannia* Sw. (Rubiaceae, Hamelieae) se concentran en áreas premontanas y montanas de América Central y el sur de México y muestran una variación morfológica notable, pero aquí se tratan con menos variación que algunos autores anteriores han concluido. En particular aquí la forma y el color de la corola y la forma del fruto se consideran características al nivel de especie, y la forma de las hojas y el tamaño y la posición de la inflorescencia se consideran menos variables que antes se ha propuesto. Catorce especies nuevas a la ciencia se descubrieron a través de exploraciones recientes en América Central y América del Sur, y se describen aquí. Un grupo de especies incluye las plantas de *Hoffmannia* de Nicaragua, Costa Rica, Panamá y el noroeste de

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Colombia con vesículas hormigueras (i.e., formicarios) en pares en la base de la lámina de cada hoja. Estas plantas recientemente se incluyeron todas en una sóla especie, *H. vesiculifera* Standl., pero dos más especies anteriormente descritas se reconocen aquí, *H. morii* Dwyer y *H. kirkbridei* Dwyer, con cinco especies nuevamente descritas y todas las especies de *Hoffmannia* con vesículas hormigueras se distinguen aquí en una clave. Las especies de *Hoffmannia* con vesículas hormigueras en las hojas que se describen nuevamente aquí son: *H. formicaria* C. M. Taylor de Costa Rica y el oeste de Panama, la cual se distingue de *H. morii* por las inflorescencias pedunculadas, las flores pediceladas y las corolas de color blanco, amarillo verdoso o rosado; *H. limonensis* C. M. Taylor de Costa Rica y el oeste de Panama, la cual se distingue de *H. vesiculifera* por las corolas con sus lobos agudos a acuminados y más largos que el tubo; *H. pseudovesiculifera* C. M. Taylor del oeste de Panama, la cual se distingue de *H. vesiculifera* por las inflorescencias escorpioides y las corolas con sus lobos más largos que el tubo, y estes lobos por lo general excepcionalmente largos dentro del género; *H. subcapitata* C. M. Taylor de Costa Rica, la cual se distingue de *H. kirkbridei* por los pecíolos más cortos, las inflorescencias subcapitadas y pedunculadas y los lobos del cáliz más largos y más anchos; y *H. veraguensis* C. M. Taylor del oeste de Panama, la cual se distingue de *H. formicaria* por los lobos del cáliz más cortos y la corola de tamaño menor. Las otras especies de *Hoffmannia* que se describen aquí no tienen vesículas hormigueras en las hojas: *H. barbillana* C. M. Taylor de Costa Rica se distingue de *H. longipetiolata* Pol. por las hojas sésiles con la base redondeada y el hábito epifítico; *H. boliviana* C. M. Taylor de Bolivia y Peru se distingue de *H. obovata* (Ruiz & Pav.) Standl., *H. latifolia* (Bartl. ex DC.) Kuntze y *H. pearcei* Rusby por los pecíolos más largos, las hojas más anchas y las flores de tamaño menor; *H. coriacea* C. M. Taylor del centro de Perú se distingue dentro de *Hoffmannia* por las angostas hojas coriáceas y la corola con el tubo más largo que los lobos; *H. costaricensis* C. M. Taylor de Costa Rica se distingue de *H. valerioi* Standl. por los lobos del cáliz más cortos y las hojas oblanceoladas; *H. micrantha* C. M. Taylor de Costa Rica se distingue de *H. hammelii* C. M. Taylor por las corolas de color anaranjado, pardo o purpúreo y agudas en el botón; *H. pacifica* C. M. Taylor de Costa Rica se distingue de *H. hammelii* por las hojas subsésiles y redondeadas a corduladas en la base; *H. rivalis* C. M. Taylor de tierra baja en Perú se distingue por su hábito de reófilo, los tallos densamente pubescentes, las angostas hojas y las flores pequeñas; *H. tilaranensis* C. M. Taylor de Costa Rica se distingue de *H. nicotianifolia* (M. Martens & Galeotti) L. O. Williams por las flores de tamaño mayor y de color rojo a purpúreo y las hojas más grandes; y *H. turrialbana* C. M. Taylor de Costa Rica se distingue de *H. pittieri* Standl. por las hojas subsésiles, truncadas a corduladas en la base y con numerosas venas secundarias además las inflorescencias racemiformes paucifloras.

Key words: Ant plants, Bolivia, Colombia, Costa Rica, Ecuador, Hamelieae, *Hoffmannia*, IUCN Red List, Panama, Peru, Rubiaceae.

The Neotropical genus *Hoffmannia* Sw. (Rubiaceae, Hamelieae) comprises perhaps 100 species of herbs, subshrubs, and low woody plants found in the understory of wet vegetation from sea level to montane forests. These plants are characterized by opposite or verticillate leaves, deciduous stipules that are interpetiolar or very shortly fused around the stem, axillary cymose inflorescences of varied form, 4-merous homostylous flowers, rather small corollas with the lobes imbricate in bud, generally 2-locular ovaries, and small fleshy baccate fruits containing numerous angled seeds. The stipules are often distinctive in form, with part or all of their structure fleshy to quite succulent, frequently protruding or spreading from the stem, and sometimes glandular and/or ornamented with additional projections. *Hoffmannia* is found from Mexico through Central America and the Andes to western Argentina, and in Jamaica, the Lesser Antilles, and Venezuela; however, reports of *Hoffmannia* from the Guianas were apparently all based on misidentifications of *Patima* Aubl. (Delprete et al., 2005; Taylor & Lorence, 2010). *Hoffmannia* has never been studied as a whole, though a number of regional treatments have been published (Standley, 1936, 1938; Standley & Williams, 1972; Steyermark, 1974; Dwyer, 1980; Burger & Taylor, 1993) as well as several overviews of the genus in particular regions (Standley, 1934; Dwyer, 1969; Williams, 1973; Burger, 1999). No infrageneric classification has been proposed for this genus; instead most study has focused on circumscribing it and distinguishing individual species (Lorence & Dwyer, 1988; Burger & Taylor, 1993; Delprete et al., 2005). During study of recently collected specimens of Neotropical Rubiaceae, several undescribed species of *Hoffmannia* were discovered and necessitate a review of the genus and its morphology.

Hoffmannia belongs to the tribe Hamelieae (Robbrecht & Manen, 2006; Bremer & Eriksson, 2009), which has its center of diversity in southern

Mexico and northern Central America. All five of the genera of Hamelieae are found here: *Omiltemia* Standl. and *Pinarophyllon* Brandegee are restricted to this region, and *Deppea* Cham. & Schltdl. (Lorence & Dwyer, 1988), *Hoffmannia* (Burger, 1999), and *Hamelia* Jacq. (Elias, 1976) have species-level radiations here. Only *Hamelia* and *Hoffmannia* reach South America, with a minority of their species there. Vegetatively these last two genera are often confused, but, when fertile, *Hamelia* can be recognized by its terminal inflorescences and 5-merous flowers. *Hoffmannia* is also frequently confused with *Notopleura* (Benth. & Hook. f.) Bremek. (Psychotrieae), which is often sympatric and similar in habit, and often has similar fleshy projecting stipules. However, *Notopleura* can be separated by its pseudoaxillary inflorescences (i.e., borne in only one axil of the node vs. consistently in both axils in *Hoffmannia*), 5-merous flowers, and drupaceous fruits with two to six plano-convex pyrenes, with each pyrene containing only one seed.

MORPHOLOGY OF *HOFFMANNIA*

Hoffmannia includes a notable range of morphological variation, as noted by previous authors (Burger, 1999). This variation has complicated its taxonomy. Here several morphological characters of *Hoffmannia* are reviewed across the genus as a basis for further study.

Plants of *Hoffmannia* are often quite succulent and consequently shrink and often change form when dried, so study of these species only as dried specimens has long been recognized as limiting (Dwyer, 1969). In particular, many *Hoffmannia* species have distinctive succulent stipules whose form is lost on dried specimens. The form of such succulent stipules is characteristic of individual species of *Notopleura* (Taylor, 2001), and it seems likely that the same is true for *Hoffmannia*, but field observations are needed.

Several *Hoffmannia* species have been distinguished in part based on their verticillate rather than opposite leaf arrangement, but in fact this arrangement may vary within a species: verticillate-leaved species have occasional opposite-leaved plants, and conversely plants of typically opposite-leaved species occasionally produce verticillate leaves at some nodes. Such variation has been noted in species descriptions, but not always in identification keys. Petiole and leaf blade size have also been used to distinguish species, but in fact these structures often vary markedly in size within many *Hoffmannia* species, sometimes even on consecutive stem nodes of a single plant. The full range of this variation has not been documented in many descriptions.

Inflorescence arrangement has been considered by several authors to be widely variable within *Hoffmannia* species (Dwyer, 1969; Burger, 1999) and has been described only generally for most species. However, the inflorescence arrangement changes significantly over time in many *Hoffmannia* species: the young inflorescences are compact and subcapitate or have only very short axes when the first flowers open, then these axes elongate as the fruits develop and subsequent flowers open, and the inflorescence becomes more lax and often develops a characteristic arrangement. This developmental sequence has often been overlooked, but when it is considered *Hoffmannia* species can be characterized by the form of their expanded inflorescence, whether cincinnate, dichasial to umbelliform, or scorpioid-racemiform.

The flower color of *Hoffmannia* species has also sometimes been regarded as unusually variable in Rubiaceae (Dwyer, 1969; Burger, 1999), in several cases ranging from pink to rose-red, dark red, yellow, orange, or white. However, when species are circumscribed with a narrower range of variation in stipule, inflorescence, and corolla form, then flower color is usually also less variable. The remaining *Hoffmannia* species with apparently broad ranges of flower color probably deserve additional study, including field observations. No flower odor has been reported in collection data studied.

The comparative length of the corolla tube versus the lobes seems to be characteristic of individual species of *Hoffmannia*, as noted by several authors (e.g., Standley, 1934). *Hoffmannia* flowers with the corolla lobes much longer than the tube and widely spreading at anthesis present an open, flat to concave flower and have been traditionally described as rotate. However, these corollas do have a short, cylindrical, tubular base, so this form is not entirely comparable to other flowers described as rotate. Lorence and Dwyer (1988) studied both dried and living plants and confirmed the imbricate corolla aestivation of *Hoffmannia*, as noted by Standley (1934, 1936, 1938), Dwyer (1969), and Burger (1999). Lorence and Dwyer found that corolla lobes are often only very narrowly overlapping and that their arrangement may be variously simple imbricate, alternative, or quincuncial, sometimes all on the same plant. The basis for Delprete's (1998) unique description of the corolla aestivation of *Hoffmannia* as left-contorted is not known and possibly problematic for his generic comparison there.

Dwyer (1969) noted variation in stamen number in *Hoffmannia* and reported flowers on some plants with four corolla lobes, but variously three, four, or five stamens. Dwyer treated these plants with different stamen numbers as distinct species, but other authors have considered this variation similar to the idiosyncratic individual flowers with anomalous corolla lobe and stamen numbers found in most species of Rubiaceae and have not recognized these as separate species (e.g., Burger, 1999). Dwyer also noted prolongations and ornamentations of the anther connective, and suggested that this feature is characteristic and perhaps diagnostic of individual species; it is not evaluated in this present article but merits study.

Dwyer (1969) and Hayden (1968) also noted variation in locule number in *Hoffmannia*, with most flowers of most species 2-locular, but some species characteristically 3- or 4-locular. In fact, some *Hoffmannia* species of Mexico and Central America have consistently 4-locular ovaries (*H. oaxacensis* Lorence & Dwyer ex Borhidi, *H. tetrastigma* Donn. Sm.), and some others are variable with both 3- and 4-locular ovaries (*H. cuneatissima* B. L. Rob., *H. nesiota* Donn. Sm.).

Hoffmannia's fruits are generally fleshy, though they are spongy or mealy and often rather dry instead of juicy. The fruits are usually baccate and dispersed as an intact structure, but Lorence and Dwyer (1988) noted that sometimes these fruits are tardily dehiscent to release the seeds contained in the dry interior of the locules. The locule walls are sometimes stiffened so that the fruits on dried specimens may appear to contain two to four pyrenes (contributing to the confusion between *Hoffmannia* and *Notopleura*), but these locule walls rupture easily and irregularly to release the numerous tiny dry seeds. Dwyer (1969) noted that the fruits are often removed by frugivorous animals from the plants as soon as they are ripe, thus as with some species of *Psychotria* L. the fruit color may change quickly just before dispersal so that the color generally described for a particular species may not be the mature fruit color. However, some *Hoffmannia* species may indeed produce fruits of more than one color, as in some species of *Gonzalagunia* Ruiz & Pav.; field observations are needed to confirm this. The detailed seed morphology of a few *Hoffmannia* species was studied by Hayden (1968), but the seeds of most *Hoffmannia* species have not been described or measured.

TAXONOMIC CONCEPTS AND BIOGEOGRAPHY

At least two thirds of the species of *Hoffmannia* are found in Mexico and Central America and on average appear to have rather limited geographic distributions there and a higher rate of endemism or highly localized distribution than found in most other Rubiaceae genera (Williams, 1973; Burger, 1999). The pattern of individual species distributions here suggests that species-level radiations have occurred within southern Mexico and northern Central America, and separately within Costa Rica and Panama. In contrast, the species of *Hoffmannia* found in South America are on average more widely distributed, except in the mountains of Venezuela, where there also appears to be a species-level radiation (Steyermark, 1974). Two species are found on Isla del Coco in the Pacific Ocean (Trusty et al., 2006), and both are endemic while most of the other Rubiaceae found there are conspecific with mainland plants.

Kiehn (1995) noted that polyploidy is found in the tribe Hamelieae, including within several species of *Hoffmannia* (Kiehn, 1986). He also documented within-species chromosome number variants that are not multiples, but represent some other type of aneuploid variation. This chromosomal variability may play a role in the morphological complexity of this genus.

THE *HOFFMANNIA VESICULIFERA* GROUP

One group of *Hoffmannia* plants is particularly distinctive: the *H. vesiculifera* or vesiculate-leaved group comprises low to robust herbs and subshrubs with a pair of well-developed vesicles or formicaria at the base of each leaf blade, hirsute or hispid pubescence at least on the youngest growth, cymose to capitate inflorescences, and usually white to yellow corollas. (The specific epithet of *H. vesiculifera* Standl. was originally published with the variant spelling "vesciculifera," but that spelling has not been found in Latin usage and is cited as incorrect by the reference "Words by William Whittaker" <http://lysy2.archives.nd.edu/cgi-bin/words.exe>; as an orthographic error, Standley's spelling is correctable.) The vesiculate-leaved plants are known from southern Nicaragua through Panama and perhaps also occur in northwestern Colombia, but such reports are unconfirmed by this present study. One species from Panama, *H. dwyeri* W. C. Burger, is similar to the vesiculate-leaved species in its pubescence and general aspect, and has unusual pandurate leaf blades. These leaf blades are narrowed near the base, then shortly broadened and flared, then truncate at the base of the blade tissue with this basal flared portion revolute to somewhat cupuliform. *Hoffmannia dwyeri* may represent an intermediate condition between the vesiculate-leaved plants and those without ant vesicles, or it may have an unusual form of ant vesicle; however, this basal leaf portion does not form a closed vesicle and there is no evidence on the specimens of ants inhabiting this structure, so *H. dwyeri* is provisionally excluded from the *H. vesiculifera* group.

Standley (1934), Dwyer (1980), and Burger (1999) circumscribed only one to three species among the vesiculate-leaved plants. They all recognized *Hoffmannia vesiculifera* (Dwyer, 1980: 243, fig. 52) with an unusually broad range of morphological variation, even for *Hoffmannia*, and Standley explicitly considered the presence of the ant vesicles to distinguish one widespread species rather than a group of species. Burger generally accepted this conclusion, but did recognize a second vesiculate-leaved species, *H. kirkbridei* Dwyer, and Dwyer recognized both of those species plus *H. morii* Dwyer. In contrast, this vesiculate-leaved group is here regarded as an example of a species-level radiation in southern Central America, and eight species are distinguished here based on details of the inflorescence arrangement, form and size of the calyx lobes, and form, size, and color of the corollas. This classification of the vesiculate-leaved plants benefits from numerous *Hoffmannia* collections made since those previous studies.

KEY TO SPECIES OF THE *HOFFMANNIA VESICULIFERA* GROUP

1a. Leaves with petioles (i.e., below the vesicles) 4–11 cm long; leaf blade 10–18 cm wide; calyx lobes 1.5–3 mm long; fruit white .... *H. kirkbridei*

1b. Leaves sessile or with petioles to 2 cm long; leaf blade 7–15.5 cm wide; calyx lobes 2.5–15 mm long; fruit pink to red (unknown in *H. subcapitata*).

2a. Inflorescences sessile or subsessile, subcapitate or densely congested-cymose; calyx lobes 4–5 mm long, weakly arched to usually recurved at apex, more densely pubescent in distal portion, often red to purple or green with red to purple trichomes; corolla yellow, orange, or red, with tube 4–5 mm long and lobes ca. 5 mm long .... *H. morii*

2b. Inflorescences sessile or pedunculate, variously capitate, subcapitate, glomerulate, cymose, cincinnate, or scorpioid-racemiform; calyx lobes 2.5–17 mm long, generally erect or straight, and variously glabrous, uniformly pubescent along their length, or pubescent throughout but more densely so at apex; corolla white, yellow, pink, or pale green, with tube 2–14 mm long and lobes 4–15 mm long.

3a. Inflorescences corymbiform or dichasial; calyx lobes 10–17 mm long; corolla with tube 13–14 mm long and lobes 6–10 mm long, the tube clearly longer than the lobes .... *H. vesiculifera*

3b. Inflorescences capitate, subcapitate, glomerulate, cincinnate, or scorpioid-racemiform; calyx lobes 2.5–7 mm long; corolla with tube shorter than or about equal to lobes.

4a. Calyx lobes 4–7 mm long, linear; corolla in bud sharply acute, at anthesis with lobes 10–14 mm long, acute to acuminate or apiculate; shrubs or subshrubs generally flowering at 1–3 m tall ... *H. limonensis*

4b. Calyx lobes 2.5–5 mm long, triangular to linear; corolla in bud acute to obtuse or rounded, at anthesis with lobes 5–7 mm long, obtuse to acute; herbs or subshrubs to 2 m tall, often flowering at 0.5–0.8 m tall.

5a. Inflorescences subcapitate or congested-cymose, subglobose in overall shape, with bracts developed, ligulate, 1.2–2 mm wide; calyx lobes ligulate, rather broad, 1.2–2 mm wide; corolla yellow, unlined .... *H. subcapitata*

5b. Inflorescences cincinnate or scorpioid-racemiform, corymbiform to irregular in overall shape, with bracts reduced or linear, up to 0.5 mm wide; calyx lobes linear or narrowly triangular, 0.1–0.5 mm wide; corolla white, yellow, orange, greenish yellow, or pink, sometimes marked with lines inside.

6a. Calyx lobes 7–10 mm long; corolla yellow to orange, unlined, with tube 8–11 mm long and lobes 14–20 mm long .... *H. pseudovesiculifera*

6b. Calyx lobes 1–4 mm long; corolla white, greenish yellow, or pink, often marked with lines inside, with tube 3–6 mm long and lobes 3.5–6 mm long.

7a. Calyx lobes 2.5–4 mm long, sparsely to densely villous or hirsute with pubescence often denser in apical portion; corolla with tube 4–5 mm long and lobes 5–7 mm long .... *H. formicaria*

7b. Calyx lobes 1.2–4 mm long, glabrescent; corolla with tube 3–4 mm long and lobes 3.5–5 mm long .... *H. veraguensis*

METHODS

The new species described here are treated together (i.e., the species are not separated according to the presence of ant vesicles) and arranged in alphabetical order. These new species were discovered among specimens made by various projects focused on floristic study of tropical forest regions that are not well known to science, with most of the collections made within the last 15 years. Additional collection data for the specimens cited here are available at <http://www.tropicos.org>, along with high-resolution digital images of the type specimens or reference specimens of the species newly described here and the previously described species keyed here.

Conservation status assessment methodology. The study presented here is taxonomic and floristic: the objective is enumeration of the species that belong to various Rubiaceae genera and the species that occur in the area of tropical Central and South America. The methods employed here correspond only to this objective; thus this study is based on survey of specimens collected over a number of years using varied survey methods aimed at various objectives. The specimens here used to delineate the range and commonness of these new species were located through a nonexhaustive survey of several herbaria, and no field studies have been done targeting the occurrence of these species where they are known or expected to grow. Thus the floristic information presented here is a simplified presence report based on incomplete survey of the available data, which are uneven and incomplete for this region (Schulman et al., 2007). Knowledge of the true geographic range and the population size and dynamics of a species are essential to understanding the threats to its existence, and thus to understanding its actual conservation status; documentation of the existence of a species based on one or several museum collections does not provide adequate data to evaluate these factors. Conservation assessments are provided here for these newly described species using IUCN categories and criteria (IUCN, 2001) based on the totality of our current knowledge. The basis for these assessments in the form of a map and the calculated assessment parameters are available under the corresponding species names at <http://www.tropicos.org> (assessment parameters for each map can be seen using "Show Detail"). The assessment parameters were calculated using the IUCN Rating tool (Moat, 2007) in ArcView GIS 3.2 (ESRI, 1999), with the grid cell size used for calculating Area of Occupancy (AOO) varied between 1 and 3.16 km depending on characteristics of the species and data (IUCN Standards and Petitions Working Group, 2008). These assessments are not being submitted to IUCN for publication on the Red List (<http://www.iucnredlist.org>), and the basis for these assessments should be carefully evaluated by the reader.

TAXONOMY

Hoffmannia Sw., Prodr. 30. 1788. TYPE: *Hoffmannia pedunculata* Sw.

Soft to suffrutescent herbs, shrubs, or infrequently small trees, glabrous or variously pubescent, sometimes unbranched, sometimes apparently stoloniferous, often fleshy or rather succulent, with raphides. *Leaves* opposite or sometimes in verticils of 3 to 4, sessile to petiolate, thin-textured or fleshy in life and drying thin-textured, infrequently markedly bullate, without axillary domatia, infrequently with paired swollen vesicles 1–2 cm long at base of blade, venation eucamptodromous or brochidodromous; *stipules* interpetiolar or shortly fused around the stem, caducous or sometimes with truncate basal portion persisting at least shortly after upper portion has fallen, subtruncate to triangular, sometimes succulent, occasionally with a pyramidal or ornamented medial projection, rarely 2-lobed, infrequently apparently glandular. *Inflorescences* axillary (i.e., produced in both axils of the node), variously borne with vegetative leaves and/or along bare stems below the leaves, sessile to pedunculate, capitate, glomerulate, fasciculate, or congested to laxly cymose, bracteate or with bracts reduced, the axes dichasial or sometimes becoming cincinnate or scorpioid-racemiform. *Flowers* sessile to pedicellate, bisexual, homostylous, apparently protandrous, apparently diurnal; *calyx* limb shortly to deeply 4-lobed; *corolla* funnelform, somewhat salverform or rotate (i.e., with a narrow cylindrical tube that is significantly shorter than the widely spreading lobes), variously white, yellow, pale green, yellowish green, pink, salmon, red, or purple, internally glabrous, lobes 4, in bud imbricate simply, alternatively, or quincuncially, with all arrangements sometimes found on the same plant (Lorence & Dwyer, 1988); *stamens* (3)4(5), exserted, anthers narrowly oblong or ellipsoid-oblong, often bright white, with connective sometimes prolonged at one or both ends; ovary 2(to 4)-celled, ovules numerous, peltate on axile placentas; *stigmas* 2(to 4), linear, clavate or lanceolate, exserted, often bright white or strikingly colored. *Fruit* baccate, generally subglobose to ellipsoid, fleshy and variously juicy, mealy, spongy, or rarely ultimately capsular with apparently irregular dehiscence (Lorence & Dwyer, 1988), white, pink, orange, red, or purple-black; *seeds* numerous, angled, reticulate to foveolate, with surface granular between fenestrated walls (Hayden, 1968), 0.2–0.3 mm.

1. **Hoffmannia barbillana** C. M. Taylor, sp. nov. TYPE: Costa Rica. Limón: cantón Matina, Parque Nac. Barbilla, entrada principal, cuenca del Matina, 10°00′N, 83°23′W [apparently 83°42′W], 21 Aug. 2000, *E. Mora 1417* (holotype, INB; isotypes, CR, MO-04799715). Figure 1C, D.

Haec species a *Hoffmannia longipetiolata* Pol. foliis sessilibus subsessilibusve basi rotundatis subtruncatisve atque habitu epiphytico distinguitur.

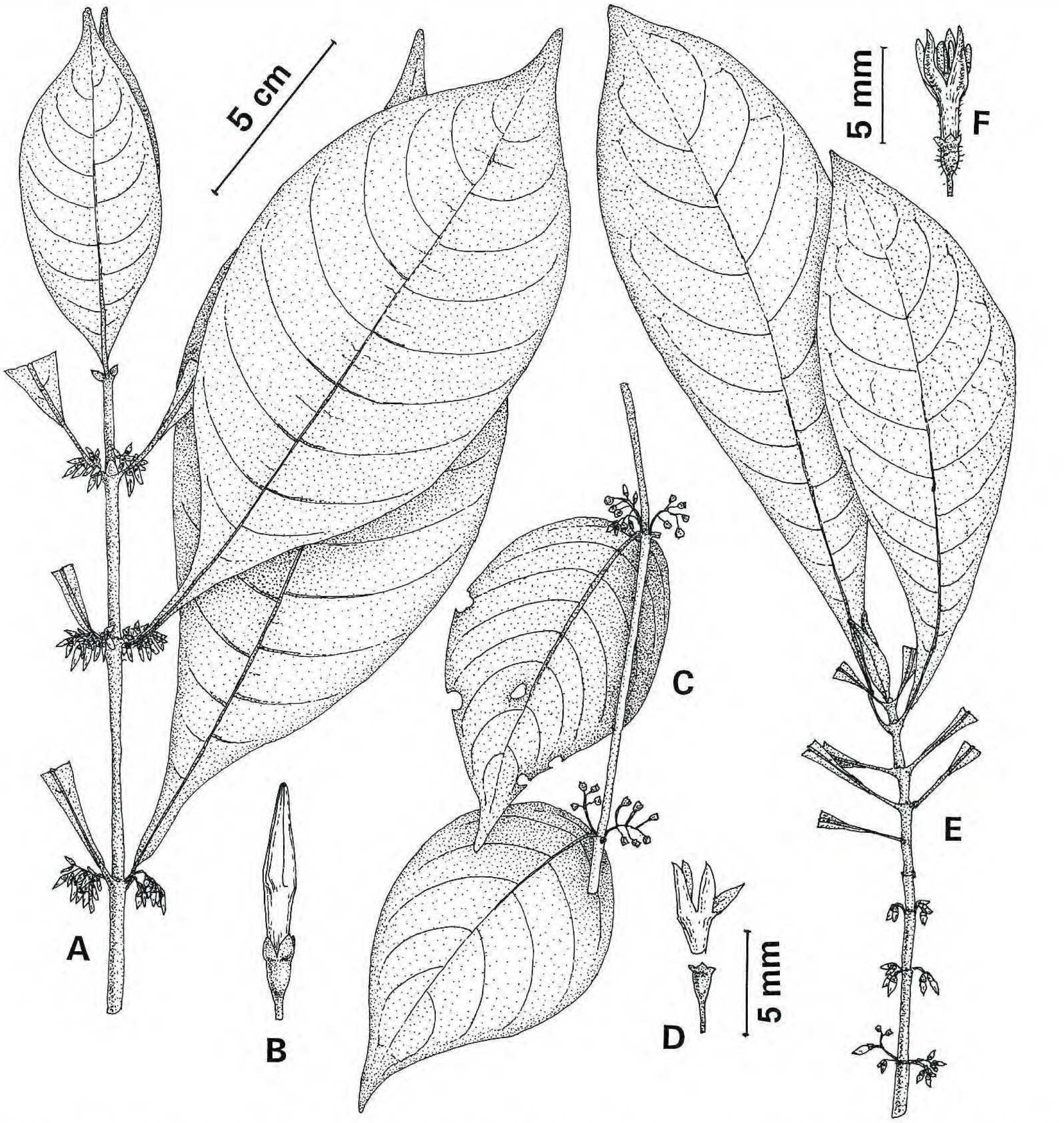

Figure 1. A, B. *Hoffmannia tilaranensis* C. M. Taylor. —A. Portion of flowering stem; based on the paratype *Taylor 3026* (DUKE). —B. Flower bud; based on the type *Haber & Bello 1685* (MO). C, D. *H. barbillana* C. M. Taylor; based on the type *Mora 1417* (MO). —C. Portion of flowering stem. —D. Flower, partially dissected. E, F. *H. costaricensis* C. M. Taylor; based on the type *Grayum & Schatz 5154* (MO). —E. Portion of flowering stem. —F. Flower bud (opened prematurely in drying press). A, C, E drawn to same scale, indicated as 5 cm; B, F drawn to same scale, indicated as 5 mm.

Herbs or soft shrubs to 2 m tall, apparently little-branched, epiphytic and pendulous; stems glabrous. *Leaves* opposite, subsessile or with *petiole* to 2 mm, glabrous; *blade* ovate, elliptic-ovate, or elliptic-oblong, 6–16 × 3–7.5 cm, glabrous, drying papery, base rounded to subtruncate, apex acute to usually acuminate; secondary veins 5 to 9 pairs, not or weakly uniting in a submarginal vein, tertiary venation not or sparsely visible; *stipules* triangular to pyramidal, 0.5–1 mm, succulent, glabrous, caducous. *Inflorescences* produced with leaves, shortly cymose to umbelliform or subfasciculate, 1–2 cm, glabrous, 3- to 6-flowered; peduncles 1 to 2 per axil, 4–6 mm, filiform; bracts reduced; pedicels 3–10 mm. *Flowers* with ovary portion ellipsoid, 1–1.2 mm, glabrous; *calyx* limb 0.3–0.5 mm, glabrous, lobed for 1/2–3/4, lobes narrowly triangular; *corolla* orange, yellow, or yellow-green, rotate, externally glabrous, tube ca. 1.5 mm, lobes triangular, ca. 2.2 mm, acute; mature anthers and stigmas not seen. Immature *fruits* ellipsoid, to 4 × 3 mm, mature color unknown.

Habitat, distribution, and phenology. Hoffmannia barbillana is known from wet forest at 300–400 m on the Caribbean slopes of Costa Rica; it has been collected with flowers in August, September, and November.

IUCN Red List category. *Hoffmannia barbillana* is known from three collection localities and meets the geographic range criterion for Critically Endangered based on its small known Extent of Occurrence (EOO), but has more than the one location required for that designation; this species meets the geographic range criterion for Endangered based on its small AOO and not more than five different locations (i.e., distinct threat regimes). This species has been found in one legally protected area. *Hoffmannia barbillana* is described by collectors as epiphytic, so, as with many epiphytes, it may be undercollected and it may also be rare. The vegetation of the region is no doubt under threat at least outside the protected area, and due to its apparently limited distribution and possible local rarity, this species is here considered Endangered due to limited geographic distribution and habitat threat (EN B1ab[iii]+2ab[iii]).

Discussion. This new species can be recognized by its sessile or subsessile, generally ovate leaves; its rather short umbelliform to fasciculate-cymose inflorescences; its small yellow to orange corollas with the lobes longer than the tube; and its epiphytic habit. This is the first species of *Hoffmannia* described by field collectors as an epiphyte; all of the other known species of *Hoffmannia* are apparently terrestrial (i.e., rooted in soil). The type collection of *H. barbillana* is from Parque Nacional Barbilla, and the specific epithet refers to this locality. This new species is similar to *H. longipetiolata* Pol., but that species can be separated by its terrestrial habit and its petiolate leaves with blades that are broadest above the middle and acute to obtuse at the base.

Paratypes. COSTA RICA. **Cartago:** cantón Turrialba, Parque Nac. Barbilla, cuenca del Matina, sendero principal río abajo, *E. Mora & E. Rojas 1539* (CR, INB). **Limón:** cantón Siquirres, Las Brisas de Pacuarito, Reserva Ecol. Río Dantas, *G. Herrera 8729* (CR).

2. **Hoffmannia boliviana** C. M. Taylor, sp. nov. TYPE: Peru. Pasco: Oxapampa, dist. Pozuzo, Parque Nac. Yanachaga Chemillén, en parte alta del puesto de vigilancia Huampal hacia el límite del pajonal, 10°11′S, 75°34′W, 1225 m, 8 Apr. 2003, *A. Monteagudo, C. Mateo & G. Ortiz 4841* (holotype, USM; isotypes, HOXA, HUT, MO-6271351). Figure 2A, B.

Haec species a *Hoffmannia obovata* (Ruiz & Pav.) Standl. et *H. pearcei* Rusby petiolo longiore atque floribus minoribus, a *H. latifolia* (Bartl. ex DC.) Kuntze petiolo bene evoluto atque pubescentia hirtella carente, ab omnibus foliis latioribus distinguitur.

Subshrubs and shrubs to 2 m tall, perhaps little-branched; stems glabrous. *Leaves* opposite; *petioles* 10–70 mm, strigillose or puberulous becoming glabrescent; *blade* elliptic to obovate, 10–23 × 4–11.5 cm, adaxially glabrous and sometimes dark and appearing velvety, abaxially sparsely strigillose to puberulous and glabrescent, drying papery, base acute to attenuate, apex shortly and rather abruptly acuminate; secondary veins 10 to 13 pairs, looping to interconnect in a usually well-developed submarginal vein; tertiary venation well developed to not at all visible; *stipules* pyramidal to lingulate, 1–2 mm, succulent, strigillose to hirtellous, often spreading at 90° from stem. *Inflorescences* produced with leaves and along stem below leaves, cymose, dichasial, or often umbelliform, 1–4 cm, strigillose-hirtellous becoming glabrescent, 3- to 9-flowered; peduncles 1 to 3(4) per axil, 0.5–2 cm; bracts reduced; pedicels 3–7 mm. *Flowers* pedicellate; ovary portion ellipsoid to subglobose, ca. 2 mm, glabrous; *calyx* limb 0.8–1 mm, strigillose-hirtellous to glabrous, lobed for 1/3–3/4, lobes triangular to broadly triangular; *corolla* white, greenish yellow, or greenish white, externally glabrous, tube 1–1.5 mm, lobes ligulate to triangular, 1.5–2 mm, obtuse to acute; anthers 1–1.5 mm; stigmas clavate, ca. 1 mm. *Fruits* subglobose, 7–8 mm diam., becoming red then bright blue or purple.

Habitat, distribution, and phenology. *Hoffmannia boliviana* is known from wet and premontane forests at 200–1515 m from central Peru through central Bolivia; it has been collected in flower from October through June and in fruit usually concurrently, from September through June.

IUCN Red List category. *Hoffmannia boliviana* does not meet the geographic range criterion for any threatened category in its EOO, but meets the criterion for Endangered in its limited AOO based on the widely scattered collection localities. However, this species is known from more than 10 locations (i.e., different threat regimes), and it is found in five different legally protected areas in two countries across an elevational range of 1300 m and a linear geographic range of ca. 1600 km. It is apparently not uncommon locally, and survives or perhaps grows preferably in secondary vegetation. It is here assessed as Least Concern (LC).

Discussion. This new species can be recognized by its general lack of pubescence; its rather large leaves borne on well-developed petioles; its rather short, usually umbelliform inflorescences; its very small flowers; and its fruits that are broadly ellipsoid

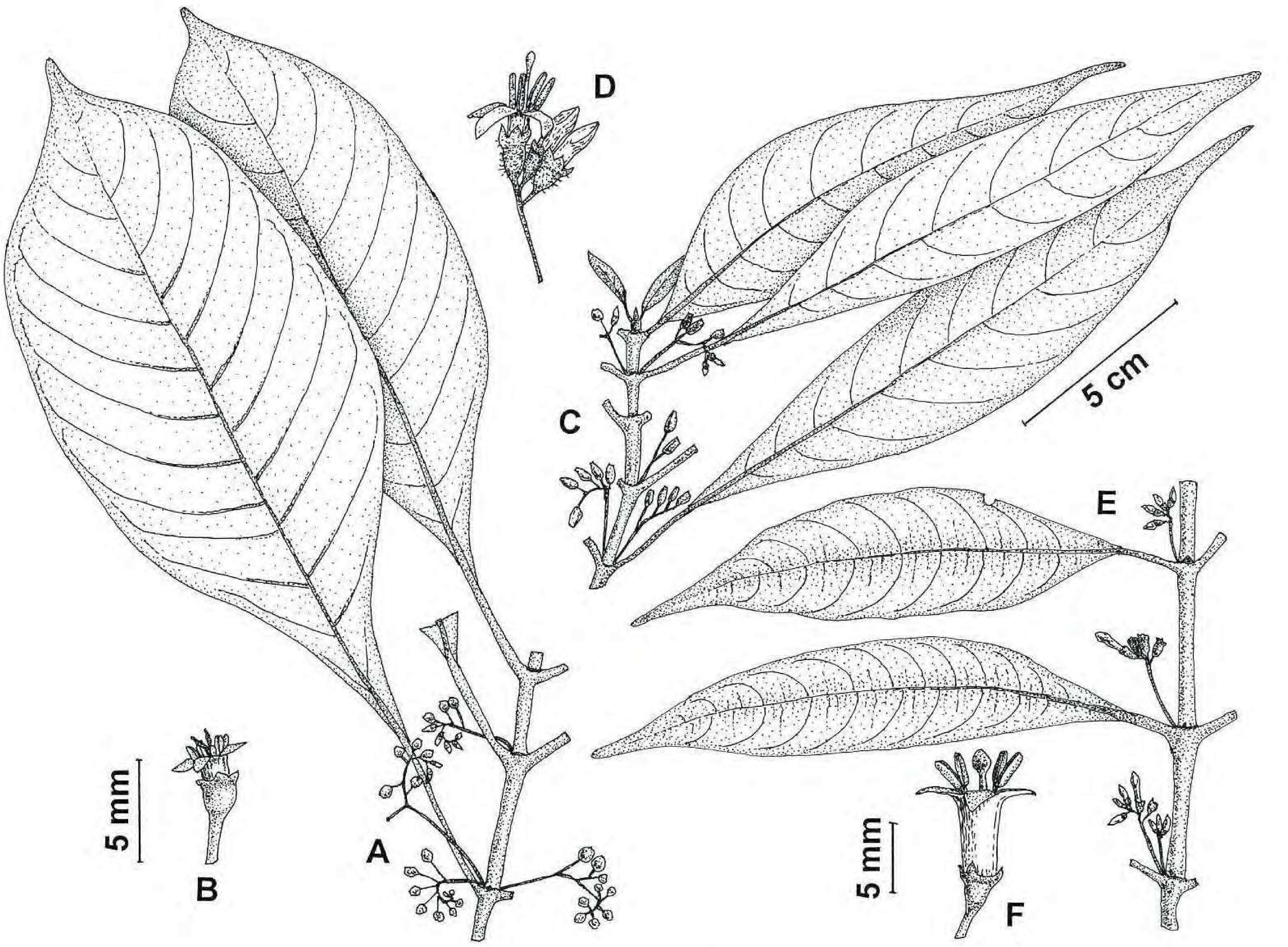

Figure 2. A, B. *Hoffmannia boliviana* C. M. Taylor. —A. Portion of fruiting stem; based on the paratype *Smith et al. 13198* (MO). —B. Flower; based on the type *Monteagudo et al. 4841* (MO). C, D. *H. rivalis* C. M. Taylor. —C. Portion of stem with inflorescence and young fruits; based on the type *Vásquez et al. 24071* (MO). —D. Portion of inflorescence with one flower at anthesis and two flower buds; based on the paratype *Rojas et al. 21* (MO). E, F. *H. coriacea* C. M. Taylor; based on the type *van der Werff et al. 17683* (MO). —E. Portion of flowering stem. —F. Flower. A, C, E drawn to same scale, indicated as 5 cm; D, F drawn to same scale, indicated as 5 mm.

to subglobose and bright blue to bright purple at maturity. Bright blue fruit color is rarely noted in *Hoffmannia*. Additionally the tertiary venation of the leaves is often rather sparsely visible. The specific epithet refers to its geographic distribution, with particularly good documentation from Bolivia.

Hoffmannia boliviana is similar to *H. obovata* (Ruiz & Pav.) Standl. and *H. pearcei* Rusby, which are also found from central Peru through central Bolivia (and may not be distinct from each other). These other two species can be recognized by their narrowly elliptic to oblanceolate leaves with the tertiary venation well developed and regularly reticulated; their generally shorter petioles (1–3 cm long); their generally yellow to red flowers; their corollas with longer tubes (2.5–3 mm long) that are longer than the corolla lobes, which are 3–6 mm long; and their fruits that are narrowly ellipsoid or ellipsoid-oblong and reported to be red or pinkish red. *Hoffmannia boliviana* is also similar to *H. latifolia* (Bartl. ex DC.) Kuntze, which is also found in the same region, but *H. latifolia* can be recognized by its hirtellous stems, leaves, and inflorescences; its narrowly oblanceolate leaves that are subsessile or borne on petioles generally only up to 5 mm long; its leaf blades with the tertiary and quaternary venation conspicuous and areolate; its white flowers; and its red, orange, or magenta fruits.

Paratypes. BOLIVIA. **Beni:** prov. Ballivián, Serranía Pilón Lajas, sobre la carr. Quiquibe–Yucumo, 30 km al O de Yucumo en La Cumbre del Pilón, *T. Killeen & K. Smith 3619* (LPB, MO); Km 25 of rd., *C. Persson & C. Gustafsson 238* (MO, S); 21 km de Yucumo, *D. N. Smith, G. Quintana & V. García 13198* (LPB, MO); 14.3 km N of bridge over Río Quiquibey, *J. C. Solomon 13904* (LPB, MO); a 130 km de San Borja, *M. Moraes R. 667* (LPB, MO); provs. Ballivián y Yacuma, Est. Biol. del Beni, comun. Cero Ocho, *I. Guareco 4* (LPB, MO). **Cochabamba:** prov. Chapare, San Rafael, *R. F. Steinbach 513* (LPB, MO); Palmar Km 18, ca. del Río Kachimayu, *J. Teran, J. Altamirano & D. Soux 352* (BOLV, MO); Guacharos, *J. Teran, J. Altamirano & D. Soux 453* (BOLV, MO), *J. Teran, J. Altamirano & D. Soux 465* (BOLV, MO); a ca. 10 km de la est. San José, *J. Teran, E. Rodríguez & D. Soux 2687* (BOLV, MO). **La Paz:** prov. Nor Yungas, Suapi, subiendo el Río Suapi, *S. Beck 30354* (LPB, MO); prov. Sud Yungas, Río Quiquibey, barranca del Río San Luis, *S. Beck 8094* (LPB, MO); Alto Beni concesión de la coop. Sapecho, *R. Seidel, M. Humaday & X. Aramayo 5703* (LPB, MO); ca. de la Colonia Cascada, *R. Seidel, X. Villavicencio, A. Acebey & T. Krömer 8305* (LPB, MO). **Santa Cruz:** prov. Ichilo, Parque Nac. Amboró, along Río Sanguayo 1 km NE of entrance into first Andean foothills, *M. Nee & M. Saldías 35952* (MO, NY); 10.5 km SO (línea recta) de Huaytí, *M. Saldías P. 503* (MO, SCZ). PERU. **Huánuco:** prov. Leoncio Prado, 80 km NE of Tingo María toward Agaytia near La Divisora, *A. Gentry, J. Revilla & J. Schunke V. 16000* (MO). **Pasco:** prov. Oxapampa, dist. Villa Rica, centro poblado Palma (Centro Bocaz), camino a Alta Atarraz, *L. Franco Mellado, E. Ortiz V., J. Mateo & R. Francis 2490* (HUT, MO); Gran Pajonal, trail betw. Chequitavo & Shumahuani, *D. N. Smith 6621* (MO).

3. **Hoffmannia coriacea** C. M. Taylor, sp. nov. TYPE: Peru. Pasco: Oxapampa, Chacos, 10°37′N, 75°17′W, 22 June 2003, *H. van der Werff, R. Vásquez, B. Gray, R. Rojas, R. Ortiz & N. Davila 17683* (holotype, USM; isotypes, HOXA, HUT, MO-6271352). Figure 2E, F.

Haec species a congeneris foliis subcoriaceis coriaceisve sat angustis atque corollae tubo lobis fere bis longiore distinguitur.

Subshrubs or shrubs to 2 m tall, apparently branched; stems glabrous. *Leaves* opposite; *petioles* 0.5–1.8 cm, glabrous; *blade* narrowly elliptic to narrowly oblanceolate, 6.5–18 × 1.8–5 cm, glabrous, drying subcoriaceous or coriaceous, apparently often pale abaxially, base acute, apex acute to acuminate; secondary veins 8 to 12 pairs, usually weakly looping to interconnect in a submarginal vein, tertiary venation generally developed; *stipules* pyramidal, 2–3 mm, succulent, glabrous, often spreading at ca. 90° from stem. *Inflorescences* produced with leaves, cymose and usually dichasial, 2–4 cm, glabrous, 3- to 11-flowered; peduncles 1 to 2 per axil, 0.5–1.5 cm; bracts reduced or few, ligulate, to 1 mm; pedicels 1–5 mm. *Flowers* pedicellate; ovary portion ellipsoid to obconic, ca. 2 mm, glabrous; *calyx* limb 1.5–2 mm, glabrous, lobed nearly to base, lobes triangular; *corolla* yellow or pale yellow sometimes flushed with red, externally glabrous, tube 5–6 mm, lobes lanceolate or triangular, 3–3.2 mm, obtuse to acute; anthers 2.5–3 mm; stigmas lanceolate, 1–1.2 mm. *Fruits* subglobose, 7–8 mm, red.

Habitat, distribution, and phenology. *Hoffmannia coriacea* is known from montane forest, at least sometimes on sandstone-derived soils, at 2100–2500 m in central Peru; it has been collected in flower from June through October and in fruit in June.

IUCN Red List category. *Hoffmannia coriacea* meets the geographic range criterion for Critically Endangered due to its restricted EOO, and for Endangered due to its small AOO and only two locations (i.e., different threat regimes). It is found in one legally protected area, and also outside but very close to that protected area. The habitat condition of these locations is not well documented, but certainly habitat decline is likely in the future at least outside the park. However, this general region is poorly explored, and *H. coriacea* may be more widely distributed than is now known. Therefore, it is considered Vulnerable due to limited range (VU D2), although if its habitat were known to be declining it would be considered Endangered.

Discussion. This new species can be recognized by its stiff-textured, relatively narrow leaves and its well-developed yellow corollas with the tube almost twice as long as the lobes. The specific epithet refers to the leathery leaf texture, which is unusual in *Hoffmannia*. Some specimens have diseased fruits (*Vásquez et al. 32846*, *Rojas et al. 2664*), and the flowers of these collections also lack anthers; it seems likely that this unusual flower morphology is related to the plant's infection.

Hoffmannia coriacea is similar to *H. obovata*, which is found in the same region in central Peru; however, *H. obovata* as well as most other Peruvian *Hoffmannia* species can be separated by their corollas with the tube shorter than the lobes. One species found in central Peru, *H. subauriculata* Standl., does have corollas that are similar in size and form to those of *H. coriacea*, but *H. subauriculata* is known only from lower elevations, at 700–1850 m, and can be recognized by its subsessile or very shortly petiolate leaves that are rounded to cordulate at the base.

Paratypes. PERU. **Pasco:** Oxapampa, Cordillera Yanachaga, 12 km SE of Oxapampa, rd. over shoulder of Cerro Pajonal to Villa Rica drainage, *R. Foster & D. Smith 9078* (MO); zona del amortiguamiento del Parque Nac. Yanachaga-Chemillén, Sector Chacos, *A. Monteagudo, J. Mateo, L. Chuck & A. Alvares 15033* (HUT, MO), *R. Rojas, M. Huaman, A. Peña, J. Mateo & C. Rojas 2664* (HUT, MO), *H. van der Werff, R. Vásquez, B. Gray, R. Ortiz & N. Davila 18657* (HUT, MO), *R. Vásquez, G. Castillo, V. Flores & L. Hernani 32846* (HUT, MO).

4. **Hoffmannia costaricensis** C. M. Taylor, sp. nov. TYPE: Costa Rica. San José: along Quebrada Tablazo & forested slopes above creek, NE part of Altos Tablazo, 9°50′N, 84°03′W, 1700–1800 m, 23 Apr. 1985, *M. Grayum & G. Schatz 5154* (holotype, CR; isotype, MO-05007140). Figure 1E, F.

Haec species a *Hoffmannia valerioi* Standl. lamina foliari oblanceolata usque obovata, petiolo et lobis calycinis brevioribus atque lobis corollinis longioribus distinguitur.

Shrubs to 3 m tall, perhaps little-branched; stems densely tomentulose or pilosulose-hirtellous. *Leaves* opposite, subsessile or with *petioles* to 18 mm, densely tomentulose; *blade* oblanceolate to obovate, 9.5–25 × 2.5–8 cm, adaxially glabrous or sparsely pilosulose near margins, abaxially moderately to densely puberulous to tomentulose on principal veins and puberulous to sparsely pilosulose on lamina, drying papery, base acute to attenuate, apex acute; secondary veins 8 to 12 pairs, free, extending to margins, or sometimes weakly uniting in a looping submarginal vein, tertiary venation regularly visible; *stipules* broadly triangular to pyramidal, 2–3 mm, succulent, densely tomentulose, apparently glandular at apex, deciduous. *Inflorescences* produced at 8th through 10th nodes below leaves and sometimes also in 1 to 3 basalmost (i.e., lowermost) nodes with leaves, cymose and generally dichasial, 1.5–2 cm, densely puberulous to tomentulose, 3- to 7-flowered; peduncles 1 to 3 per axil, 3–11 mm; bracts reduced; pedicels 1–2 mm. *Flowers* pedicellate; ovary portion obconic-ellipsoid, 1.2–1.5 mm, tomentulose-puberulous; *calyx* limb 0.8–1 mm, tomentulose-puberulous, lobed for 1/2–3/4, lobes triangular to broadly triangular; *corolla* greenish yellow or pale yellow, rotate, externally puberulous-hirtellous, in bud with tube to 3 mm, lobes narrowly triangular, to 7 mm; mature anthers and stigmas not seen. *Fruits* subglobose, ca. 5 mm, red.

Habitat, distribution, and phenology. Hoffmannia costaricensis is known from wet premontane and montane forest at 1500–2200 m in central Costa Rica; it has been collected with flowers April through June and with fruits in December.

IUCN Red List category. Hoffmannia costaricensis meets the geographic range criterion for Endangered based on its limited EOO, its limited AOO, and its five (at most) locations (i.e., different threat regimes). It is found in two legally protected areas; however, the habitat of these areas is in decline and the habitat outside these areas is in significant decline. This species is here considered Endangered due to limited geographic range and habitat threats (EN B1ab[iii]+2ab[iii]).

Discussion. This new species can be recognized by the combination of its dense tomentulose or pilosulose-hirtellous pubescence on the stems and stipules, its oblanceolate or obovate leaves, its short inflorescences borne mostly or all along the stems below the leaves, and its small yellowish green or pale yellow corollas with the lobes significantly longer than the tube. This new species is known only from the mountains of central and northern Costa Rica; the specific epithet refers to its distribution entirely within this country.

These plants were previously included in *Hoffmannia decurrens* Standl. (Burger & Taylor, 1993), but that name is here considered a synonym of *H. arborescens* Donn. Sm. *Hoffmannia arborescens* is also found in montane habitats of Costa Rica, but can be separated from *H. costaricensis* by its corollas with longer tubes, 7–12 mm long, and the tubes longer than the lobes. *Hoffmannia costaricensis* is also similar in Costa Rica to *H. valerioi* Standl., but *H. valerioi* is found predominantly at lower elevations, 50–1500 m, and can be recognized by its elliptic to elliptic-oblong leaf blades that are widest at or a little below the middle, its inflorescences borne with the leaves or at only one or two stem axils below the basalmost pair of leaves, and its longer calyx lobes, 1–5 mm long.

Paratypes. COSTA RICA. **Cartago:** Cerro La Carpintera, immediately N of Tres Ríos & E of San José, *C. M. Taylor 3866* (DUKE). **San José:** Cerro Pico Blanco, 4 km S of Escazú, *R. W. Lent 3984* (MO); cantón de Aserrí, Cerros de Escazú, cuenca del río Suárez, *J. F. Morales & R. J. Abarca 1812* (INB, MO); ca. 5 km from Panamerican Hwy. in Talamancas, along rd. to Copey, *C. M. Taylor 3103* (DUKE).

5. **Hoffmannia formicaria** C. M. Taylor, sp. nov.

TYPE: Costa Rica. Limón: cantón de Limón, El Progreso, Fila Matama, Valle de La Estrella, siguiendo el sendero de la avioneta, por la fila hasta los 1700 m, 9°47′N, 83°09′W, 1350 m, 19 Apr. 1989, *G. Herrera & A. Chacón 2660* (holotype, CR; isotype, MO-3840515). Figure 3A, B.

Haec species a *Hoffmannia morii* Dwyer habitu humili, inflorescentia pedunculata congesta usque laxe cincinnata, floribus pedicellatis atque corolla alba luteoviridi roseave intus saepe lineolata distinguitur.

Herbs or subshrubs flowering at 0.3–1 m tall, generally unbranched; stems densely villous or hirsute-tomentose, sometimes eventually becoming glabrescent, trichomes often flushed with red or purple. *Leaves* opposite; *petiole* (i.e., below vesicles) 2–15 mm, densely villous, hirsute, or tomentose-hirsute; *blade* elliptic, elliptic-oblong, or obovate, 5.5–23 × 3.5–11 cm, adaxially sparsely to moderately hirsute or hirtellous, abaxially hirsute, villous, or hirtellous with pubescence denser on principal veins, drying papery, base cuneate to truncate and abruptly narrowed with a pair of ellipsoid vesicles 1–2.5 × 0.7–1 cm, apex obtuse to acute or acuminate; secondary veins 8 to 14 pairs, free or sometimes weakly looping to interconnect, tertiary venation well

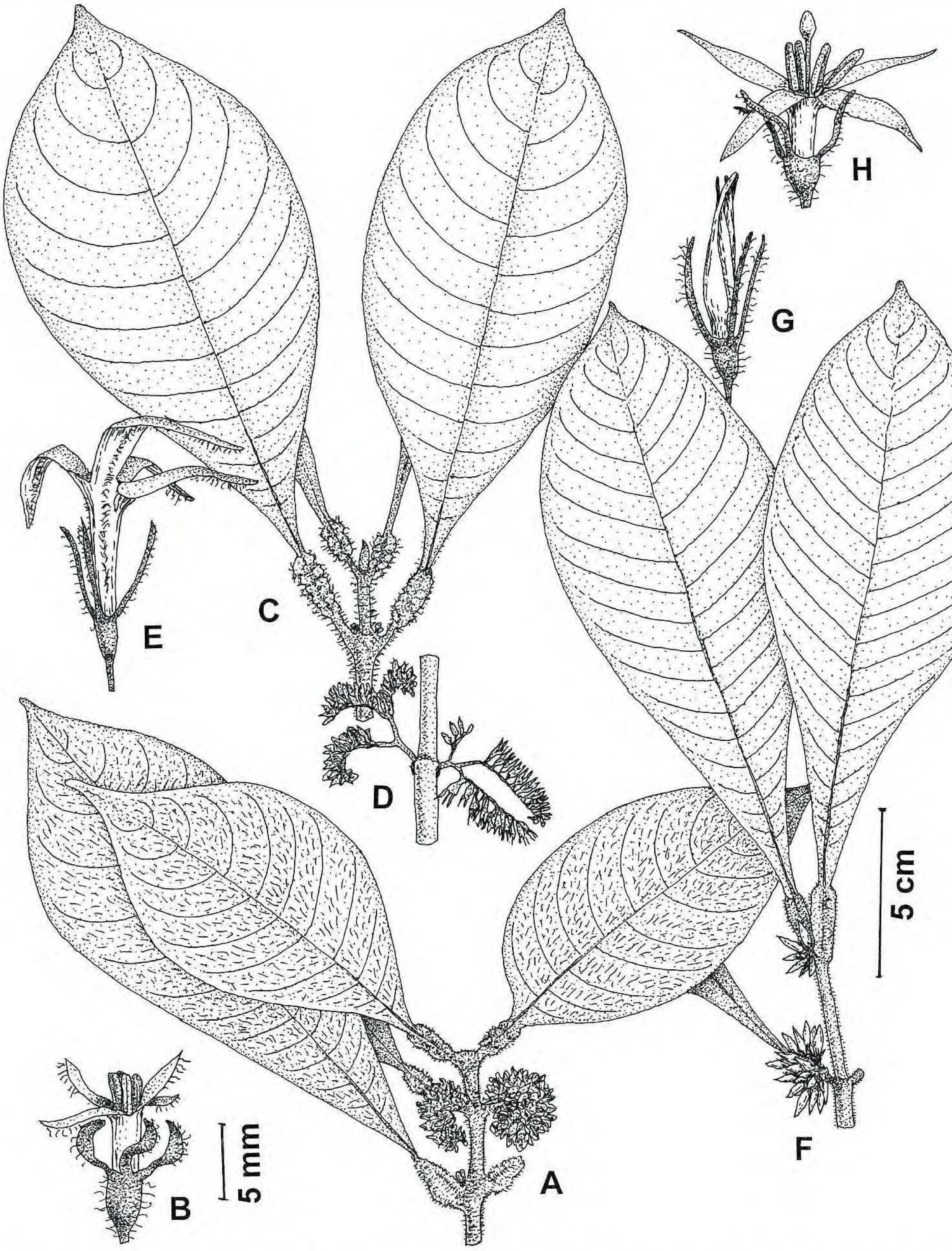

Figure 3. Some vesiculate species of *Hoffmannia*. A, B. *H. formicaria* C. M. Taylor. —A. Portion of flowering stem; based on the type *Herrera & Chacón 2660* (MO). —B. Flower; based on the paratype *McPherson 12285* (MO). C–E. *H. pseudovesiculifera* C. M. Taylor. —C. Apical portion of stem. —D. Portion of stem below leaves with infructescence. C, D based on the paratype *Correa et al. 3179* (MO). —E. Flower; based on the paratype *Antonio 3083* (MO). F–H. *H. limonensis* C. M. Taylor; based on the paratype *Mora 1059* (MO). —F. Portion of flowering stem. —G. Flower bud. —H. Flower at anthesis. A, C, D, F drawn to same scale, indicated as 5 cm; B, E, G, H drawn to same scale, indicated as 5 mm.

developed; *stipules* narrowly triangular or narrowly ligulate, 2–4 mm, hirsute or villous. *Inflorescences* produced in axils of leaves, congested to laxly cincinnate, 1.5–3 cm, densely hirsute or villous, many-flowered, sessile or with peduncles 1 to 2 per axil, to 1 cm; bracts reduced; pedicels 2–4 mm. *Flowers* pedicellate; ovary portion ellipsoid to obovoid, 1–1.5 mm, glabrescent; *calyx* limb divided nearly to base, hirsute or villous, lobes narrowly triangular to linear, 2.5–4 mm; *corolla* white, greenish yellow, or pink, often internally marked with red or brown lines, rotate or rotate-salverform, externally glabrous except villosulous to hirsute on upper part of lobes and/or along middle of lobes, tube 4–5 mm, lobes narrowly triangular, 5–7 mm, sharply acute; anthers ca. 3 mm; stigmas ovoid, ca. 1 mm. *Fruits* ellipsoid, 7–10 mm, red.

Habitat, distribution, and phenology. *Hoffmannia formicaria* is known from wet, premontane, and montane forests at 700–1900 m on the Caribbean slopes of Costa Rica and western Panama; it has been collected in flower March through May and in August and in fruit in February, March, November, and December.

IUCN Red List category. *Hoffmannia formicaria* meets the geographic range criterion for Vulnerable based on its limited EOO, and for Endangered based on its small AOO. However, there are apparently more than 10 locations (i.e., different threat regimes), and this species is found in eight legally protected areas in two countries. *Hoffmannia formicaria* seems to be locally common, but to inhabit a rather narrow ecological and elevational zone; within this zone, there are some areas that are well preserved and protected, but some that are in habitat decline. Because the number of locations of this species could fall below 10 due to habitat destruction in the near future, this species is here considered Near Threatened (NT).

Discussion. This new species can be recognized by its low habit; its dense, often red or purple, villous to hirsute-tomentose pubescence; its shortly petiolate leaves of moderate size with paired vesicles at the base; its short cincinnate inflorescences; its well-developed calyx lobes; and its corollas with the sharply acute lobes a little longer than the tube. The specific epithet refers to the leaf vesicles or formicaria, which are distinctive, though not unique to this species. Ants are sometimes reported to inhabit the vesicles (*Stevens 13571*, MO), but sometimes are not present (*Knapp 5096*, MO).

This new species is similar to *Hoffmannia morii*, found in the same region in Panama; however, *H. morii* differs in its larger habit, with the plants usually flowering at 1 m tall or more; its sessile to subsessile, capitate, subcapitate, or densely congested-cymose inflorescences with the axes not developed and the flowers generally sessile (although sometimes the fruits are borne on pedicels that elongate after flowering); its calyx lobes with the apices usually thickened, a little curved, and densely pubescent; and its corollas that are bright yellow to orange. *Hoffmannia formicaria* is also similar to *H. vesiculifera*, which is also found in the same region in Panama, but *H. vesiculifera* can be recognized by its rounded-corymbiform or clearly dichasial inflorescences with one to three pairs of enlarged foliaceous bracts, its longer calyx lobes (10–17 mm long), and its corollas with the tube 13–14 mm long and at least twice as long as the lobes. *Hoffmannia formicaria* is also similar to *H. limonensis* C. M. Taylor and *H. veraguensis* C. M. Taylor, which are both described and distinguished later in this article.

Paratypes. COSTA RICA. **Alajuela:** cuenca del Sarapiquí, Virgen del Socorro, *R. Kriebel 569* (INB); along rd. Colonia Virgen del Socorro, barranca Río Sarapiquí, *W. D. Stevens 13571* (CR, MO). **Cartago:** Refugio Nac. Vida Silvestre Tapantí, *L. D. Gómez 18904* (MO), *R. Kriebel 1961* (INB); S Tapantí along rd. along E slope above Río Grande de Orosi, *W. Burger & R. G. Stolze 5660* (DUKE, F), *W. Burger & R. Liesner 6848* (CR, F, MO); Sendero Oropendula, *P. Delprete 5303* (CR, MO; sterile); Valle del Reventazón, Río Humo, Alto Patillos, *J. F. Morales & V. H. Ramírez 5042* (INB, MO); cantón Paraíso, Parque Nac. Tapantí-Macizo de la Muerte, cuenca del Reventazón, alrededores del túnel, *A. Rodríguez 5844* (INB); cuenca del Reventazón, Kiri Lodge, Sendero Colibrí, Orosi, *R. Kriebel 1338* (INB); cantón Jiménez, cuenca del Reventazón, Refugio Vida Silvestre La Marta, *D. Solano, A. Solano & R. Kriebel 165* (INB); Parque Nac. Tapantí, *A. Weissenhofer 3653* (CR, WU); sector Quebrada Segunda, *G. Mora 426* (INB); Río Grande de Orosi, 8 km S Tapantí, *R. Lent 911* (CR); Canton Turrialba, Parque Nac. Barbilla, cuenca del Matina, Sendero Barthon, Seccion Corina-Tigre, *E. Mora, R. Barton Salazar & F. Umana Salazar 1837* (INB); Tayutic, Jicotea, altos entre río Jicotea & río Vereh, *G. Herrera & I. Martínez 8027* (CR); cantón Jiménez, cuenca del Río Pejibaye, La Selva, Albergue el Copal, sendero el Ron Ron, *D. Santamaría, D. Solano & D. Martínez 2166* (INB). **Guanacaste:** cantón Tilarán, Cordillera de Guanacaste, Zona Parque Tenorio, Tierras Morenas, cabeceras del Río San Lorenzo, *G. Rodríguez 292* (INB, MO). **Heredia:** Parque Nac. Braulio Carrillo, from park entrance at El Ceibo hike 4 hr. to Casa 1070 then 1 hr. N, *A. Gilman 102* (INB, MO). **Limón:** cerro entre Cerros Chimú y Matama, *L. D. Gómez & G. Herrera 23543* (CR, MO); El Progreso, Fila Matama, Valle de La Estrella, cabeceras del Río Cariei, *G. Herrera & A. Chacón 2793* (CR, MO); Filas al E Almirante, cuenca superior río Boyei, rumbo Fila Matama, *G. Herrera 8518* (CR); cantón Talamanca, Parque Nac. La Amistad, cuenca del Sixaola, *D. Solano 3970* (INB), *D. Solano & A. Rodríguez 4198* (INB); Río Coén, *D. Santamaría 5811* (INB); Bratsi, entre Ujarrás y San Jose Cabécar, *A. Rodríguez & D. Solano 11065* (INB); cantón Limón, Zona Parque Río Banano, cuenca del Banano, Valle de La Estrella, Fila Matama, ca. 11 km SW del pueblo de Aguas Zarcas, *D. Solano, A. Rodríguez, B. Gamboa R., D. Santamaría, E. Boza, M. Hernández Peña, M. Moraga, O. Chacón Chavarría & R. Delgado Dávila 4796* (INB). **San José:** Bajo La Hondura, *H. Kennedy & P. DeVris 3815* (CR); río Bajo La Hondura, Parque Nac. Braulio Carrillo, 25 km N de San José, *M. Sousa, L. D. Gómez, G. Davidse, C. Humphries, R. Hampshire, N. Garwood & M. Gibby 12669* (CR). PANAMA. **Bocas del Toro:** Fortuna Dam or IRHE Fortuna Hydroel. Project area, oleoducto rd. near cont. divide, *H. Churchill, G. de Nevers & H. Stockwell 4691* (MO); oleoducto rd. ca. 1 km N of Quebrada Arena, *S. Knapp 5096* (MO); on trail along cont. divide, *G. McPherson 12285* (MO); Caribbean slopes of Cerro Fábrega at foot of

"Falso Fábrega" in Palo Seco Reserve, N tributary (on map) of Culubre River, Pavón Camp, *A. Monro & S. Cafferty 4738* (INB); faldas del "Cerro Falso Fábrega," PILA, punto 13, *D. Santamaría, D. Solano, N. Zamora, A. K. Monro & A. Solís 7719* (INB); Changuinola, PILA, *A. De Sedas Martínez & D. Solano 691* (INB); ca. 2 km from est. Alto Uri, *D. Santamaría, A. K. Monro & J. Lezcano 7402* (INB); Cerro Frio, headwaters of Río Pskui, Point 23, *D. Santamaría, A. Monro & L. Martínez 7885* (INB). **Bocas del Toro/Chiriquí border region:** along rd. betw. Fortuna & Chiriquí Grande, 4.5–8.5 mi. N of bridge over Fortuna Dam, near cont. divide, *T. Croat & M. Grayum 59995* (MO), *T. Croat & M. Grayum 60182* (MO), *T. Croat & M. Grayum 60432* (MO). **Chiriquí:** La Fortuna or IRHE Hydroel. project, S side of river, *B. Hammel 2042* (MO); N of Carr. Oleoducto, Quebrada de Arena, *S. Knapp, W. J. Kress & B. Hammel 4073* (MO); ridge 8 km N of Los Planes de Hornito, *S. Knapp 5002* (MO); above Gualaca, *G. McPherson 6701* (MO); dist. Gualaca, correg. Hornito, Reserva Forestal Fortuna (STRI), *J. L. Clark & L. Espinosa 8563* (MO, US).

6. Hoffmannia limonensis C. M. Taylor, sp. nov. TYPE: Costa Rica. Limón: Reserva Biol. Hitoy Cerere, siguiendo la fila entre Río Hitoy y Río Cerere, 9°39′N, 83°06′W, 300 m, 26 Feb. 1989, *G. Herrera & M. Solís 2462* (holotype, CR; isotype, DUKE-334110, MO-3761357). Figure 3F–H.

Haec species a *Hoffmannia vesiculifera* Standl. corollae lobis 10–14 mm longis acutis usque acuminatis apiculatisve tubo longioribus distinguitur.

Subshrubs or shrubs to 3 m tall, perhaps little-branched or unbranched; stems densely villous or tomentose-hirsute with uniseriate trichomes 1–2 mm. *Leaves* opposite; *petiole* (i.e., below vesicles) 2–15 mm, densely villous or tomentose-hirsute; *blade* elliptic to obovate, 17–36 × 7–17 cm, adaxially sparsely to densely hirsute on blade and sometimes veins, abaxially densely puberulous to hispidulous along principal veins and sparsely to moderately hirtellous along higher-order veins and sometimes also on lamina, drying papery, base cuneate to acute or attenuate then with a pair of ellipsoid vesicles 1.5–3 × 0.5–1 cm, apex acuminate; secondary veins 14 to 19 pairs, not or weakly looping to interconnect in apical part of blade, tertiary venation well developed; *stipules* narrowly triangular, 4–10 mm, somewhat succulent, densely villous or hirsute. *Inflorescences* produced with leaves, subcapitate to glomerulate or densely congested-cymose, densely hirsute or villous, many-flowered, sessile, subsessile, or with peduncle 1 per axil, to 1.2 cm; heads or cymes subglobose or rounded, 2–3.5 cm diam., usually enclosed by 2 to 4 foliaceous bracts 1–3 × 0.8–2 cm, ovate to lanceolate; remaining bracts linear to narrowly triangular, 4–10 mm; pedicels to 3 mm. *Flowers* sessile or pedicellate; ovary portion obconic, ca. 2.5 mm, villous or hirsute to glabrescent; *calyx* limb divided nearly to base, lobes linear, 4–7 mm, sparsely hirsute or villous in apical portion with trichomes 1–1.5 mm; *corolla* yellow to orange, rotate, glabrous externally, tube 4–5 mm, lobes lanceolate, 10–14 mm, acute to acuminate or apiculate; anthers narrowly lanceolate, ca. 7 mm; stigma ovoid, ca. 1.5 mm. *Fruits* ellipsoid, ca. 8 mm diam., red.

Habitat, distribution, and phenology. *Hoffmannia limonensis* is known from wet and premontane forests at 200–900 m on the Caribbean slopes of Costa Rica and western Panama; it has been collected in flower February through May and in fruit in October.

IUCN Red List category. *Hoffmannia limonensis* meets the geographic range criterion for Endangered based on its limited EOO and AOO, but there are more than 10 locations (i.e., different threat regimes). This species is known in six legally protected areas in two countries. *Hoffmannia limonensis* seems to be locally rather common and to inhabit a rather narrow ecological and elevational zone; within this zone, it is found in several areas that are well preserved and protected, but also in a few that are in decline. If some of the subpopulations in unprotected and declining areas were to be eliminated, this species would fall to very close to 10 or fewer locations and it is here considered Near Threatened (NT).

Discussion. This species can be recognized by its densely villous to tomentose-hirsute pubescence; its well-developed leaves with paired elongated vesicles at the base; its capitate to congested, sessile to shortly pedunculate, densely pubescent inflorescences that are sometimes enclosed by one or two pairs of foliaceous bracts; its well-developed linear calyx lobes; and its yellow to orange corollas with the well-developed lobes longer than the tube and narrowed to usually prolonged tips. This new species is known from the Caribbean coast of Costa Rica through western Panama, but has been most often collected with the most complete specimens in Limón Province, Costa Rica; the specific epithet refers to this locality. On the specimens studied, the tips of the corolla lobes are usually spreading in bud, but this may be an artifact of drying. The label data of some collections (*Liesner et al. 15408, 15451*; *de Nevers 4098*) report the presence of ants in the leaf vesicles, but those of other specimens report no ants (*Lent 529*). The fully developed flowers studied appear to have only one rather large ovoid stigma, which may be formed of two stigmas that are not spreading.

Hoffmannia limonensis is similar to *H. vesiculifera* of Panama; *H. vesiculifera* can be recognized by its generally smaller leaves (15–25 × 6–10 cm), its inflorescences borne on generally longer peduncles (1–4 cm long), and its corollas with longer tubes (13–14 mm long) and shorter lobes (6–10 mm long). *Hoffmannia limonensis* is also similar to *H. formicaria*, described previously in this article and found in the same general region; *H. formicaria* can be separated by its generally smaller leaves, its pedunculate cincinnate inflorescences, its shorter calyx lobes, and its white, greenish yellow, or pink corollas with shorter lobes.

Paratypes. COSTA RICA. **Cartago:** 13 km E of Turrialba on hwy. Limón, canyon Río Chitaría, *R. Liesner, E. Judziewicz & B. Pérez G. 15408* (CR, MO); cantón Turrialba, Reserva Biol. Barbilla, cuenca del Matina, sendero Valle Escondido, *E. Mora C., L. Pacheco & A. Rojas 263* (CR, INB, MO); Parque Nac. Barbilla, cuenca del Matina, Sendero Quebrada, *E. Mora & E. Rojas 1585* (INB); vera del río Chitaría, ca. del puente carr. Siquirres, Turrialba, *J. Gómez-Laurito 684* (CR), *J. Gómez-Laurito 6817* (CR); Finca Tres Equis, Chitaría, Turrialba, *C. H. Lankester L-21* (CR). **Limón:** ridge separating Quebrada Cañabral from Río Barbilla & slope leading to latter, *M. Grayum, G. Herrera & R. Robles 8757* (CR, MO); betw. headwaters Río Madre de Dios & Quebrada Barreal, *M. Grayum, G. Herrera & R. Robles 8800* (CR, MO); betw. Cerro Jacrón & Cerro Bitárkara, trail betw. "Sitio Rangale" & Cuen, *D. Hazlett 5135* (CR, MO); along hwy. C.R. 233, 8 km N of Tres Equis, *R. Lent 529* (MO); 37 km NE of Turrialba on hwy. Limón, 8 km N of Linda Vista, *R. Liesner, E. Judziewicz & B. Pérez G. 15451* (CR, MO); Matina, Parque Nac. Barbilla, cuenca del Matina, sendero Las Pitas, Quebrada El Dulce, *E. Mora 1059* (CR, INB, MO); cantón Limón, Río Segundo, Asunción, *L. D. Gómez & G. Herrera 23499* (CR, MO); Faja Costeña de Limón, La Bomba, La Asunción, aguas arriba Río Banano, Fila Asunción, *Q. Jiménez, A. Rodríguez & A. Estrada 1832* (CR, INB, MO); cantón Talamanca, Amubri, camino entre Amubri & Soki, cabeceras del Río Ñabri, *G. Herrera 3137* (CR, MO); Bratsi, Alto Lari, siguiendo fila entre Río Dapari & Río Lari, *G. Herrera 5170* (CR, INB, MO); Parque Nac. La Amistad, cuenca del Sixaola, *A. K. Monro & D. Santamaría 5702* (INB), *D. Santamaría, A. Monro, M. Moraga & B. Gamboa R. 5948* (INB); Fila Buhu, *D. Santamaría, A. Monro, B. Gamboa R. & M. Moraga 5976* (INB); camp by Kivut, trail up from camp & 4 km SW, *J. Bittner 1556* (CR, INB); Reserva Indígena Talamanca, Alto Urén, *G. Gallardo 93* (INB); Siquirres, Barbilla, entre Quebrada Jesús & Quebrada San Miguel ruta Cerro Tigre, *G. Herrera & G. Valvarde Matamoros 8833* (CR). PANAMA. **Panamá:** headwaters of Río Chagres, Río Esperanza & Río Piedras, *G. de Nevers 4098* (MO).

7. **Hoffmannia micrantha** C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: cantón de Osa, Fila Costeña, Fila Cruces, N of headwaters of Río Piedras Blancas, W slope of Cerro Anguciana, 8°49′N, 83°11′W, 950–1400 m, 8 Dec. 1993, *M. Grayum, B. Hammel, R. Aguilar & J. Gómez 10616* (holotype, CR; isotypes, INB, MO-04886290). Figure 4D, E.

Haec species a *Hoffmannia hammelii* C. M. Taylor foliis plerumque majoribus venatione tertiaria haud vel vix manifesta atque corolla aurantiaca brunnea purpureave distinguitur.

Subshrubs or shrubs to 4 m tall, branched; stems hirtellous or villosulous to glabrous. *Leaves* opposite; *petioles* 10–60 mm, hirtellous or villosulous to glabrous; *blade* elliptic or elliptic-obovate, 9–34 × 3.5–12.5 cm, adaxially glabrous, abaxially glabrous or villosulous to hirtellous along principal veins, drying papery, base obtuse to acute or attenuate, apex acute to acuminate; secondary veins 6 to 13 pairs, looping to interconnect in a weak to well-developed undulate submarginal vein, tertiary venation developed; *stipules* pyramidal to ovoid, 1–2 mm, succulent, strigillose quickly becoming glabrescent, deciduous. *Inflorescences* produced with leaves and extensively along stems below leaves, scorpioid-racemiform to cincinnate and usually secund, slender, puberulous or strigillose to glabrescent, 4- to 12-flowered; peduncles 1 to 3 per axil, 1–1.5 cm; bracts reduced; pedicels 2–6 mm. *Flowers* pedicellate; ovary portion ellipsoid to obovoid, 1.2–1.5 mm, strigillose or puberulous to glabrous; *calyx* limb 0.5–0.8 mm, puberulous to glabrous, lobed for 1/4–3/4, lobes broadly triangular to rounded; *corolla* orange, dull yellow-orange, brown, tan, or dull purple, salverform, externally glabrous or puberulous, tube 2–3 mm, lobes triangular, 2.5–4 mm, acute; stamens and stigmas not seen. *Fruits* subglobose, ca. 5 mm diam., greenish becoming white, then red, then at least sometimes purple.

Habitat, distribution, and phenology. Hoffmannia micrantha is known from wet and premontane forest at 150–1400 m in the Golfito and Osa Peninsula regions of southern Costa Rica; it has been collected in flower from June through August and in December and in fruit in September, October, and December.

IUCN Red List category. Hoffmannia micrantha meets the geographic range criterion for Endangered based on its limited EOO and AOO, but only qualifies as Vulnerable due to its more than five but not more than 10 locations (i.e., different threat regimes). It is found in three legally protected areas, and is in general an endemic of a relatively small region of southern Costa Rica; other species are known with similar distribution, so this is probably an accurate general outline of its range. Several of the known locations of *H. micrantha* are reasonably well preserved and protected, but others are certainly in decline. Therefore, this species is considered Vul-

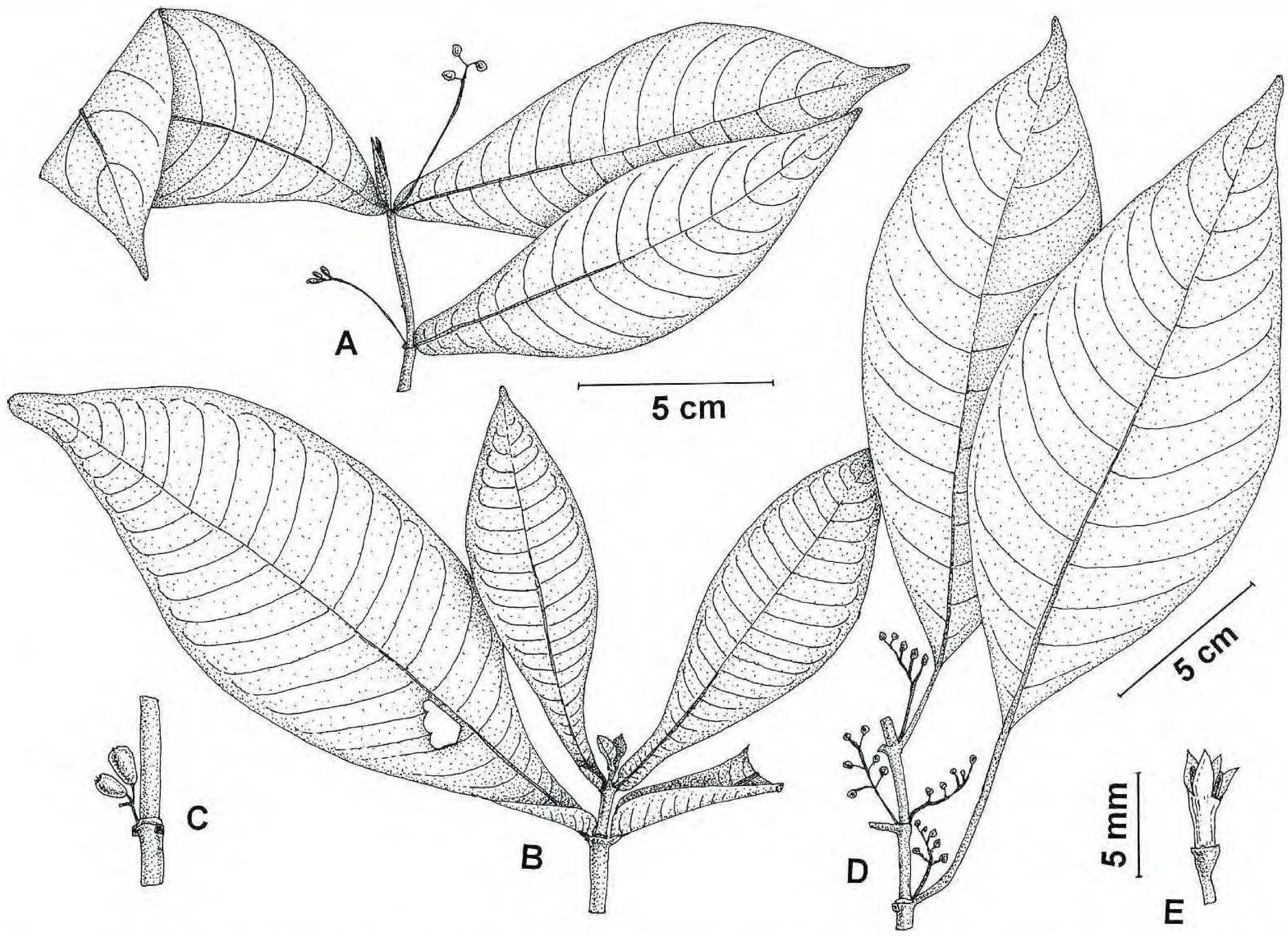

Figure 4. —A. *Hoffmannia pacifica* C. M. Taylor, portion of stem with young fruits; based on the paratype *Croat & Hannon 79131* (MO). B, C. *H. turrialbana* C. M. Taylor; based on the paratype *Téllez et al. 5309* (MO). —B. Apical portion of stem. —C. Portion of stem below leaves, with infructescence. D, E. *H. micrantha* C. M. Taylor. —D. Portion of fruiting stem; based on the paratype *Herrera 4104* (MO). —E. Flower; based on the paratype *Will 16/08/99/106* (MO). A, B, C drawn to same scale, indicated as 5 cm.

nerable due to limited geographic distribution and habitat decline (VU B1ab[iii]+2ab[iii]).

Discussion. This new species can be recognized by its well-developed petioles; its rather large leaf blades with developed but undulating submarginal veins; its short succulent stipules; its short scorpioid-racemiform or cincinnate inflorescences often borne along the stems below the leaves; its very small, dully colored corollas with the lobes at least slightly longer than the tube; and its apparently small fruits. The specific epithet refers to its small flowers. The flowers on the specimens studied are all immature or not adequate to dissect; the fruits seen and measured all appear to be immature also.

Hoffmannia micrantha is similar in particular in its inflorescences and small, dully colored flowers to *H. hammelii* C. M. Taylor, which is known from the same general region; however, *H. hammelii* can be recognized by its mostly shorter petioles (0.5–2.5 cm long), its mostly smaller leaf blades (7–18 × 4–7 cm) with the tertiary and often the quaternary venation more evident, and its corollas that are usually paler in color, i.e., white, greenish white, greenish yellow, or cream.

Paratypes. COSTA RICA. **Puntarenas:** La Gamba, Parque Nac. Esquinas, *S. Will 16/08/99/106* (MO); Sendero Catarata near Rainforest Lodge, *A. Weissenhofer W55–15.6.1997* (INB, WU); cantón Golfito, Parque Nac. Corcovado, Cerro Rincón, Dos Brazos de Río Tigre, *G. Herrera 4104* (CR, INB, MO); Jiménez, cuenca superior del Río Madrigal, *G. Herrera 4692* (CR, INB, MO); Est. Agujas, *E. Mora, D. Rubí, E. Fletes & J. Azofeifa 645* (INB), *E. Mora, D. Rubí, E. Fletes & J. Azofeifa 736* (INB, MO); Parque Nac. Piedras Blancas, Finca Don Avillan, betw. La Gamba & Golfito, *A. Huber & A. Weissenhofer 2198* (CR); cantón Osa, Fila Costeña, Río Piedras Blancas, 2 km al N, alrededores del Cerro Anguciana, *R. Aguilar, M. Segura & F. Quesada 2052* (INB, MO); along new rd. Piedras Blancas to Rincón de Osa, *M. Grayum 3418* (CR, MO); Reserva Forestal de Golfo Dulce, Rancho Quemado, ca. 15 km W of Rincón, *B. Hammel, G. Herrera, M. M. Chavarría & A. Solís 16971* (CR, DUKE, INB, MO), *M. Nepokroeff & B. Hammel 739* (CR), *F. Quesada 178* (INB, MO), *J. Solomon 19275* (CR, INB, MO); Finca Gilberto Padilla, *A. L. Marín 76* (INB, MO); sector Sureste, *J. Marín & D. Marín 524* (CR, INB, MO); cantón Puntarenas, La Pitahaya, Rincón, margen izquierda río Aranjuez, *G. Herrera 9063* (CR). **San José:** Los Llanos de Santa María, Filas Las Rejas, *O. Valverde, L. Gutiérrez & A. Estrada 114* (CR).

8. **Hoffmannia pacifica** C. M. Taylor, sp. nov. TYPE: Costa Rica. San José: cantón de Tarrazú, Los Llanos de Santa María, 9°32′N, 84°01′W, 800 m, 9 July 1997, *A. Estrada, O. Valverde, L. Gutiérrez & H. Gómez 967* (holotype, CR). Figure 4A.

Haec species a *Hoffmannia hammelii* C. M. Taylor foliis subsessilibus ad basim rotundatis usque truncatis cordulatisve distinguitur.

Herbs, subshrubs, or shrubs to 2 m tall, unbranched or little-branched; stems densely villosulous-hirtellous to glabrescent. *Leaves* opposite, sessile or with *petiole* to 3 mm, hirtellous to glabrescent; *blade* oblanceolate and often falcate, 5.5–14 × 2–5.5 cm, glabrous, drying papery to stiffly papery, base narrowed then abruptly rounded to truncate or cordulate, apex acute or weakly acuminate; secondary veins 7 to 11 pairs, looping to interconnect in an undulating submarginal vein, with tertiary and quaternary venation often well marked abaxially; *stipules* triangular, ca. 4 mm, flattened or perhaps fleshy, deciduous leaving a persistent fleshy truncate base 0.5–2 mm. *Inflorescences* produced with leaves, racemiform, 2.5–6.5 cm, puberulous to glabrous, 3- to 8-flowered; peduncles 1 to 2 per axil, 1.5–5 cm, slender; bracts reduced; pedicels 2–5 mm. *Flowers* pedicellate; ovary portion ellipsoid, 1.5–1.8 mm, glabrous; *calyx* limb 1.5–2 mm, glabrous, lobed for ca. 1/2, lobes narrowly triangular; *corolla* fuchsia or greenish red, salverform, externally glabrous, tube in bud to 3 mm, lobes in bud ovate, to 2.5 mm, shortly acuminate; anthers in bud ca. 2 mm; stigma not seen. *Fruits* subglobose, ca. 5 mm diam., red, with persistent calyx limb 1–1.5 mm, lobed for 1/4–2/3, lobes broadly triangular.

Habitat, distribution, and phenology. *Hoffmannia pacifica* is known from wet forests at 0–1400 m on the Pacific slopes of Costa Rica; it has been collected in flower in July, September, and October and in fruit in January, July, and from August through October.

IUCN Red List category. *Hoffmannia pacifica* meets the criterion for Endangered based on its limited EOO, small AOO, and not more than five locations (i.e., different threat regimes). It is not known from any legally protected area, and is apparently found only in a relatively small region of southern Costa Rica; some other species are known with a similar distribution so this is probably an accurate outline of its range. The habitats of this region are no doubt in decline now or in the near future due to development, and this species does not appear to be found in secondary vegetation. Therefore, this species is considered Endangered due to limited geographic range and habitat threat (EN B1ab[iii]+2ab[iii]).

Discussion. This new species can be recognized by the combination of its subsessile, rather small (for *Hoffmannia*), often somewhat asymmetric leaves that are rounded to cordulate at the base and have the secondary veins united into a looping submarginal vein, and its few-flowered, generally racemiform inflorescences. This new species is known only from the Pacific slopes of central-southern Costa Rica; the specific epithet refers to this distribution.

Hoffmannia pacifica is similar to *H. inamoena* Standl. and *H. hammelii*, both also found in Costa Rica. These species are similar particularly in their leaves with the secondary veins fused into a submarginal vein and the higher-order venation thickened and visible inside the areoles of the tertiary venation. However, *H. inamoena* and *H. hammelii* can be recognized by their leaf blades that are acute to obtuse at the base and borne on well-developed petioles. *Hoffmannia pacifica* is also generally similar to *H. stephaniae* L. A. González & Poveda, which is also found in the same general region on the Pacific slopes of Costa Rica; however, *H. stephaniae* can be separated by its very narrow leaves (0.5–1.5 cm wide) with more numerous secondary veins (17 to 21 pairs) (González & Poveda, 2004).

Paratypes. COSTA RICA. **Puntarenas:** wooded slopes above Golfito, *W. Burger & G. Matta U. [i.e., G. Mata U.] 4785* (CR, F, MO). **San José:** cantón Acosta, Sabanilla, Cerro El Cornelio, *J. Sánchez, A. Ruíz & R. Chacón 1155* (CR); cantón Pérez Zeledón, along rd. betw. San Isidro [del] General & Dominical, Fila Tinamastes, *T. Croat & D. Hannon 79131* (MO); Finca La Laguna, Los Angeles, *O. Valverde, A. Estrada & H. Gómez 247* (CR); cantón Tarrazú, cuenca del Naranjo & Paquita, San Carlos, Bajo La Virgen, Finca Ríos Paraíso, camino a cerros de Quepos, *A. Rodríguez, J. González, A. Estrada & A. Quesada 8113* (INB); Faja Costeña del Valle del Parrita entre Nápoles & Santa Marta, *O. Vargas 462* (INB, MO); San Marcos de Tarrazú, estribación del cerro al SE pueblo Naranjito, contiguo al Río Naranjo, *A. Cascante, G. Herrera & J. Sánchez 905* (CR); Tinamaste, Finca de los Suizos, *A. Estrada, D. Arguello, E. Volio & H. Binder 872* (CR); cantón Turrubares, Zona Parque Cerro de Turrubares, cuenca del Tarcoles, San Luis, faldas del Cerro Pelón, *A. Rodríguez, A. Estrada, R. Chacón, D. Solano & A. Soto 9345* (INB).

9. **Hoffmannia pseudovesiculifera** C. M. Taylor, sp. nov. TYPE: Panama. Bocas del Toro: detrás del camp. Corriente Grande, Changuinola IRHE, 22 Feb. 1980, *M. D. Correa A., A. Taylor, N. Salazar, R. Mendoza, T. Beliz, C. Vergara & D. Vergara 3542* (holotype, PMA; isotype, MO-3741460). Figure 3C–E.

Haec species a *Hoffmannia vesiculifera* Standl. inflorescentia cincinnoideo-scorpioidea atque corollae lobis longioribus tubum excedentibus distinguitur.

Herbs or subshrubs to 1.2 m tall, perhaps little-branched; stems densely villous or hirsute-tomentose. *Leaves* opposite, subsessile or with *petiole* to 20 mm, densely villous or villous-tomentose; *blade* obovate, 13–27 × 6–13.5 cm, adaxially villous with trichomes distributed across lamina, abaxially villous to villosulous with trichomes mostly borne on veins, drying papery, base cuneate to acute and prolonged then with a pair of narrowly ellipsoid vesicles 1–3 × 0.3–0.6 mm, apex obtuse then usually abruptly shortly acuminate; secondary veins 11 to 16 pairs, free, reticulating with margins, or sometimes a few pairs weakly looping to interconnect near margins, tertiary venation well developed; *stipules* triangular to narrowly triangular, 4–6 mm, densely villous, deciduous. *Inflorescences* produced generally with leaves, cincinnate to scorpioid sometimes becoming racemiform with age, often bifurcate from peduncle, 3–7 cm, densely villous, many-flowered; peduncles 1 to 2 per axil, 0.5–1 cm; bracts reduced; pedicels 2–3 mm. *Flowers* pedicellate; ovary portion narrowly ellipsoid or narrowly obconic, ca. 3 mm, densely villous; *calyx* limb lobed nearly to base, moderately to densely villous, lobes narrowly triangular to linear, 7–10 mm; *corolla* yellow to orange, rotate, externally villous to glabrescent, tube 8–11 mm, lobes lanceolate, 14–20 mm, acuminate; anthers 2–3 mm; stigmas ovate, ca. 1 mm. *Fruits* not seen.

Habitat, distribution, and phenology. *Hoffmannia pseudovesiculifera* is known from wet forest at ca. 300 m on the Caribbean slopes of western Panama; it has been collected in flower in December, January, and February.

IUCN Red List category. *Hoffmannia pseudovesiculifera* meets the geographic range criterion for Endangered based on its small AOO and not more than five locations (i.e., different threat regimes); because there are only two collection localities, the EOO cannot be calculated. This species is found in one legally protected area, which may not have significant continuing habitat decline at the moment, but is likely to have decline in the future due to local development. However, this area is not well explored botanically so this species may be more common and widespread than is evident from these specimens. This species is considered Vulnerable due to its limited number of locations and probable threats (VU D2), although if this species were in fact locally rare and the habitat declining rapidly, then it would be considered Endangered.

Discussion. This new species can be recognized by its low habit; villose or hirsute-tomentose pubescence; shortly pedunculate inflorescences generally with two cincinnate, scorpioid, or racemiform portions without foliaceous bracts; and relatively large corollas with the lobes longer than the tube. The specific epithet refers to the similarity and previous confusion of this new species with *Hoffmannia vesiculifera*. *Hoffmannia pseudovesiculifera* is so far known only from the lower slopes of Bocas del Toro in western Panama, but this region is poorly known, and this species may not be uncommon and may also grow in southeastern Costa Rica.

Hoffmannia pseudovesiculifera is similar to *H. vesiculifera*, but *H. vesiculifera* can be recognized by its pedunculate, corymbiform, dichasially branched inflorescences enclosed by one to three pairs of foliaceous bracts and its corollas with shorter lobes (6–10 mm long) that are half as long as the tube.

Paratypes. PANAMA. **Bocas del Toro:** 15 km up Changuinola River to IRHE dam site No. 1, *T. Antonio 3083* (MO); al NO del Camp. Changuinola 1 de Corriente Grande, Cerro Bracha, *M. Correa A., A. Taylor, R. Mendoza, N. Salazar, T. Beliz & C. Vergara 3179* (MO, PMA).

10. Hoffmannia rivalis C. M. Taylor, sp. nov. TYPE: Peru. Amazonas: prov. Condorcanqui, dist. El Cenepa, comun. San Antonio, Río Cenepa, bosque de ribera, 4°30′S, 78°11′W, 300 m, 16 June 1997, *R. Vásquez, A. Peña, E. Chávez & E. Quiaco 24071* (holotype, USM; isotype, MO-04898272). Figure 2C, D.

Haec species a congeneris habitu gracili, caulis pubescentia densa brevique, foliis angustis, floribus parvis atque fructu angusto distinguitur; etiam locos riparios inundatos habitat.

Herbs or subshrubs to 0.5 m tall, slender, branched; stems densely strigillose-tomentulose. *Leaves* opposite; *petiole* 3–10 mm, densely strigillose-tomentulose to glabrescent; *blade* narrowly elliptic to narrowly oblanceolate, 5–17 × 1.5–4 cm, adaxially glabrous, abaxially strigillose-puberulous along veins and glabrescent on lamina, drying chartaceous to stiffly papery, base acute to attenuate, apex acute to acuminate; secondary veins 4 to 8 pairs, not or rarely looping weakly to interconnect near margins, tertiary venation developed; *stipules* narrowly triangular, 1–3 mm, densely strigillose-puberulous, acute, deciduous. *Inflorescences* produced with leaves and along stems below leaves, cymose and often regularly dichasial, 1.5–3 cm, strigillose or hirtellous to glabrescent, 3- to 11-flowered; peduncles 1 to 2 per axil, 0.8–1.5 cm; bracts reduced; pedicels 1–6 mm. *Flowers* pedicellate; ovary portion narrowly ellipsoid to narrowly obconic, 1.2–2 mm, strigillose; *calyx* limb lobed nearly to base, strigillose to glabrescent, lobes narrowly triangular, 0.5–1.2 mm, acute, apparently enlarging as fruit develops; *corolla* yellow to red, salverform to rotate, externally glabrous, tube ca. 2 mm, lobes narrowly triangular to narrowly ligulate, 2.2–4 mm, acute; anthers 2–3 mm; stigmas clavate, ca. 1 mm. *Fruits* narrowly ellipsoid, ca. 8 mm, red.

Habitat, distribution, and phenology. *Hoffmannia rivalis* is known from woody vegetation along rivers in wet forests at 300–900 m, in the Río Cenepa region of southern Ecuador and northern Peru; it has been collected in flower June through August and in fruit concurrently in June.

IUCN Red List category. *Hoffmannia rivalis* meets the geographic range criterion for Endangered based on its limited EOO, small AOO, and not more than five locations (i.e., different threat regimes). It is found in one legally protected area and appears to be endemic to a relatively small region near the border of Ecuador and Peru. However, this region is not well known botanically, and the microhabitat of *H. rivalis* is inundated riversides, so this species may be more common and widely distributed than documented by collections. Whether its microhabitat is in significant decline is unknown, but presumably in some areas this habitat is adequately preserved. Therefore, this species is considered Vulnerable due to its limited number of locations (VU D2).

Discussion. This new species can be recognized by its slender habit, rather narrow elongated leaves and fruits, dense short stem pubescence, small flowers, and narrowly elliptic immature fruits, as well as apparently its riverside habitat. This is the first report of the rheophytic habit in *Hoffmannia*, and the specific epithet refers to this. Few other *Hoffmannia* species are found at these relatively low elevations in the Río Cenepa region of southern Ecuador and adjacent Peru; *H. rivalis* differs from all of the species known from this region in its smaller corollas.

Paratypes. ECUADOR. **Zamora-Chinchipe:** cantón Nangaritza, Miazi, Río Nangaritza valley, above military post, *A. Gentry 80977* (MO). PERU. **Amazonas:** prov. Condorcanqui, dist. El Cenepa, comun. Mamayaque, Río Cenepa, *R. Rojas, A. Peña & E. Chávez 21* (MO).

11. Hoffmannia subcapitata C. M. Taylor, sp. nov. TYPE: Costa Rica. Limón: Matina, Parque Nac. Barbilla, cuenca del Matina, sendero Las Pitas, Quebrada El Dulce, 9°59′N, 83°24′W, 600–700 m, 10 Apr. 2000, *E. Mora 1020* (holotype, INB; isotypes, CR, MO-6271353). Figure 5A, B.

Haec species a *Hoffmannia kirkbridei* Dwyer petiolo breviore, inflorescentia subcapitata pedunculata atque lobis calycinis longioribus latioribus distinguitur.

Robust herbs or subshrubs to 2 m tall, perhaps little-branched; stems hirtellous-tomentulose to glabrescent. *Leaves* opposite; petiole (i.e., below vesicles) 10–15 mm; *blade* elliptic, 21–32 × 11–18.5 cm, adaxially glabrous, abaxially hirtellous to hispidulous at least along principal veins, drying papery, base cuneate to attenuate then with a pair of narrowly ellipsoid vesicles 2–2.5 × ca. 0.5 cm, apex acuminate; secondary veins 9 to 10 pairs, free or looping to connect and/or reticulated into an undulate submarginal vein, tertiary venation rather well developed; *stipules* narrowly ligulate, 9–12 mm, fleshy, shortly 2-lobed, lobes 1.5–2 mm. *Inflorescences* produced with leaves, subcapitate or densely congested-cymose, densely villosulous or tomentulose-hirtellous, many-flowered; peduncles 1 to 3 per axil, 1–3 cm; heads or cymes subglobose, 0.5–1.5 cm diam.; bracts ligulate, 2–4 × 1.2–2 mm; pedicels 0.5–2.5 mm. *Flowers* pedicellate; ovary portion obconic, ca. 2 mm, villosulous; *calyx* limb divided essentially to base, lobes ligulate, 4–5 × 1.2–2 mm, villosulous to glabrescent, obtuse or rounded, densely ciliolate; *corolla* yellow, rotate, externally glabrescent on tube and densely hirtellous or villosulous on middle or full surface of lobes, tube 2–3 mm, lobes narrowly triangular, 5.5–6 mm, acute; anthers exserted, ca. 4 mm; stigmas ovate, ca. 0.8 mm. *Infructescences* with axes elongating, becoming congested-cymose, to 3 cm wide. *Fruits* ellipsoid, 3–5 × 2–3.5 mm, laterally somewhat flattened, glabrescent, mature color unknown.

Habitat, distribution, and phenology. *Hoffmannia subcapitata* is known from wet forests at 600–1700 m on the Caribbean slopes of northern and central Costa Rica; it has been collected in flower in April and in fruit in August, October, and November.

IUCN Red List category. *Hoffmannia subcapitata* meets the geographic range criterion for Endangered based on its limited EOO, its small AOO, and not more than five locations (i.e., different threat regimes). It is found in two legally protected areas. *Hoffmannia subcapitata* seems to be restricted to a relatively narrow elevational band and habitat. Two of its known locations are apparently protected, but the third may be susceptible to habitat decline. This species is considered Vulnerable due to its limited range (VU D2), but if any part of its habitat were to

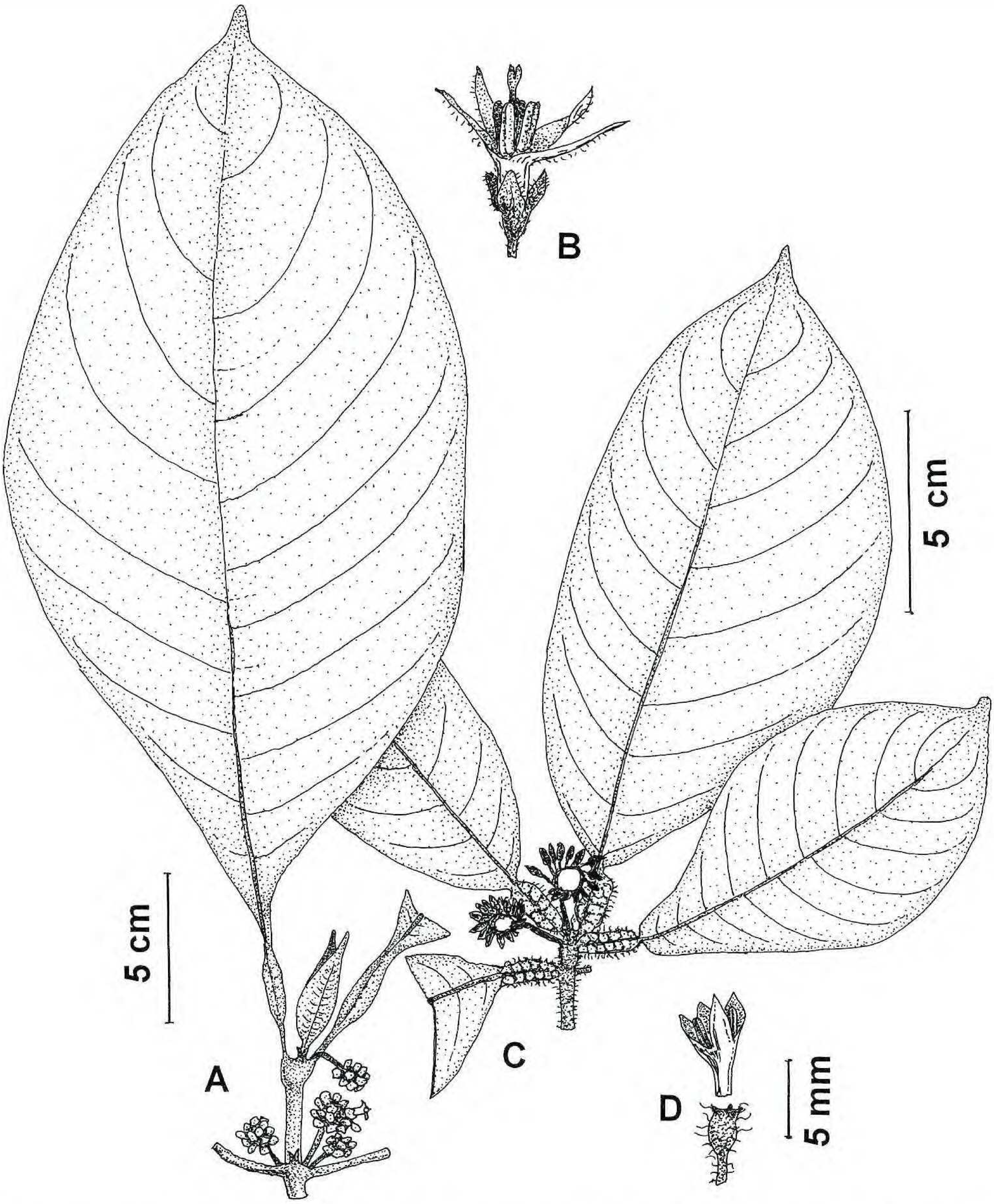

Figure 5. Some vesiculate species of *Hoffmannia*. A, B. *H. subcapitata* C. M. Taylor; based on the type *Mora 1020* (MO). —A. Apical portion of stem with inflorescence. —B. Flower. C, D. *H. veraguensis* C. M. Taylor. —C. Apical portion of stem with inflorescences; based on the paratype *Hammel 4654* (MO). —D. Flower, partially dissected; based on the type *Dressler 4790* (MO). B, D drawn to same scale, indicated as 5 mm.

decline markedly it would quickly become Endangered.

Discussion. This new species can be recognized by its relatively large leaf blades each with a pair of slender vesicles at the tapered base; its short petioles; its well-developed, shortly bilobed stipules; its shortly pedunculate inflorescences with the flowers arranged in dense subglobose groups; its well-developed ligulate calyx lobes; and its yellow corollas that are pubescent externally at least on the lobes and that have the lobes longer than the tube. The subglobose inflorescences or flower groups are unusual in *Hoffmannia*, and the specific epithet refers to this feature. The inflorescences become more lax as the fruits develop and the axes and pedicels become somewhat more prolonged and spreading.

Hoffmannia subcapitata is similar to *H. kirkbridei* of Panama, in particular in leaf size and shape and the well-developed, rather broad calyx lobes; *H. kirkbridei* is known from only two rather poor specimens that lack corollas and stipules, but can be separated from this new species by its well-developed petioles (4–11 cm long), its larger vesicles (3–7 cm long), and its cymose inflorescences that are shortly branched to one to two orders even before the fruits develop.

Paratypes. COSTA RICA. **Alajuela:** cantón San Carlos, Parque Nac. Juan Castro Blanco, cuenca del San Carlos, entrando por San Vicente, faldas del Cerro Platanar, *A. Rodríguez, V. Ramírez & G. Sancho 6141* (INB). **Limón:** cantón Limón, Zone Parque Río Banano, Valle de La Estrella, Fila Matama, ca. 11 km SW of pueblo Aguas Zarcas, *D. Solano, A. Rodríguez, B. Gamboa R., D. Santamaría, E. Boza, M. Hernández Peña, M. Moraga, O. Chacón Chavarría & R. Delgado Dávila 4898* (BM, INB), *A. Rodríguez, A. Monro, D. Santamaría, D. Solano, B. Gamboa R., E. Bosa & M. Hernández Peña, M. Moraga, O. Chacón Chavarría & R. Delgado Dávila 11457* (INB); alrededores del camp., *D. Santamaría 6567* (BM, INB).

12. Hoffmannia tilaranensis C. M. Taylor, sp. nov. TYPE: Costa Rica. Alajuela: San Carlos, San Miguel de San Isidro, 600 m, 29 June 1985, *W. A. Haber & E. Bello C. 1685* (holotype, CR; isotype, MO-05005230). Figure 1A, B.

Haec species a *Hoffmannia nicotianifolia* (M. Martens & Galeotti) L. O. Williams foliis majoribus, pedunculo breviore, corolla viridi colore purpureo atrorubrove suffusa vittatave atque tubo corollino longiore distinguitur.

Subshrubs and shrubs to 2 m tall, little-branched; stems glabrous. *Leaves* opposite; *petiole* 10–20 mm, glabrous; *blade* obovate to elliptic-obovate, 10–32 × 5–12 cm, glabrous, drying papery, base acute to attenuate, apex acuminate with tips to 2 cm; secondary veins 8 to 11 pairs, weakly uniting in a looping submarginal vein, tertiary venation not or hardly visible; *stipules* pyramidal, 1.5–3 mm, succulent, glabrous, glandular, deciduous. *Inflorescences* produced with leaves and sometimes along stems at several nodes below leaves, dichasially cymose to congested-cymose, 1.5–3 cm, puberulous to strigillose, 3- to 9-flowered; peduncles 1 to 3 per axil, 3–8 mm; bracts reduced; pedicels 2–4 mm. *Flowers* pedicellate, deflexed to pendulous; ovary ellipsoid-obconic, ca. 2 mm, puberulous-strigillose; *calyx* limb 1.2–2 mm, puberulous-strigillose, lobed for 3/4 to nearly to base, lobes ligulate to triangular; *corolla* green usually flushed or striped with purple or dark red, rotate, externally puberulous, tube in bud to 4 mm, lobes in bud to 5 mm, narrowly triangular, acute; mature anthers and stigmas not seen. Immature *fruits* narrowly ellipsoid, to 4.5 × 2 mm, color unknown.

Habitat, distribution, and phenology. *Hoffmannia tilaranensis* is known from wet lowland and premontane forest at 400–1600 m in northern Costa Rica; it has been collected in flower in May and June.

IUCN Red List category. *Hoffmannia tilaranensis* meets the criterion for Endangered based on its limited EOO, its small AOO, and not more than five locations (i.e, different threat regimes). It is not found in any legally protected area. *Hoffmannia tilaranensis* is found across a rather wide elevational range, but does not appear to be common anywhere. The habitat in the areas where this species has been found is certainly in decline, although some samples of this type of habitat are preserved in this region. All of the collections studied of this species were made about 25 years ago (1984–1986), so this species has apparently not been found recently. Therefore, this species is considered Endangered due to limited geographic range and habitat destruction (EN B1ab[iii]+2ab[iii]).

Discussion. *Hoffmannia tilaranensis* can be recognized by the combination of its glabrous stems and leaves, its rather large leaf blades that are broadest above the middle, its short cymose inflorescences with the flowers and also largest flower buds markedly drooping, and its corollas that are generally flushed or striped with purple or dark red and have the lobes longer than the tube. This new species is known from the mountains of northern Costa Rica, in particular the Cordillera de Tilarán; the specific epithet refers to this distribution.

Hoffmannia tilaranensis is similar to *H. nicotianifolia* (M. Martens & Galeotti) L. O. Williams, which is found in the same region; however, *H. nicotianifolia* can be separated here by its generally smaller leaves (1.5–6 cm wide), its usually longer peduncles (6–15 mm long), its shorter calyx lobes (0.3–1 mm long), its white to pale yellow or pale green corollas with the tube shorter (1.5–2 mm long), and its subglobose fruits.

Paratypes. COSTA RICA. **Alajuela:** Arenal Volcano, along trail from observatory to summit of Cerro Chato, *V. A. Funk, B. Umaña, F. O. Smith & others [sic on label] 10710* (MO); Reserva Forestal de San Ramón, ca. 10 km W of Lagitos, along Río San Lorencito, *B. Hammel, G. de Nevers & C. Gómez 15298* (CR, MO); N of San Ramón, Km 15–35 rd. La Tigra & Fortuna, *C. M. Taylor & C. Tingley 4320* (DUKE). **Guanacaste–Puntarenas border:** ca. 6.5 km from Santa Elena along rd. to Tilarán past Finca Hira Rosa, *C. M. Taylor 3026* (DUKE, MO).

13. Hoffmannia turrialbana C. M. Taylor, sp. nov. TYPE: Costa Rica. Cartago: 13 km E of Turrialba on hwy. to Limón, canyon of Río

Chitaría, 750–800 m, 9°55′N, 83°36 W, 10 May 1983, *R. Liesner, E. Judziewicz & B. Pérez G. 15410* (holotype, CR; isotype, MO-05005248). Figure 4B, C.

Haec species a *Hoffmannia pittieri* Standl. foliis subsessilibus ad basim truncatis usque cordulatis nervis secundariis numerosioribus, inflorescentia racemiformi pauciflora atque fructu in sicco anguste ellipsoideo distinguitur.

Subshrubs or shrubs to 2 m tall, apparently little-branched or unbranched; stems glabrous. *Leaves* opposite, sessile or subsessile; *blade* obovate or oblanceolate, 13–39 × 4.5–12 cm, glabrous, perhaps pale abaxially, drying papery, base narrowed then abruptly truncate to cordulate, apex acute; secondary veins 17 to 20 pairs, mostly united in a well-developed submarginal vein, tertiary veins not or hardly visible; *stipules* triangular to pyramidal, 2–3 mm, succulent, acute, deciduous. *Inflorescences* borne in axils of lowermost leaves or along stems below leaves, shortly umbelliform-cymose or racemiform, 1.5–3 cm, glabrous, 2- to 5-flowered; peduncles 1 to 2 per axil, 0.5–1.5 cm; bracts reduced; pedicels 4–6 mm. *Flowers* pedicellate; ovary portion ellipsoid, ca. 2.5 mm, glabrous; *calyx* limb ca. 1 mm, glabrous, lobed shallowly or for up to 1/2, lobes broadly triangular; *corolla* yellow or orange, funnelform, externally glabrous, tube ca. 8 mm, lobes triangular, ca. 4 mm, acute; stamens and stigma not seen. *Fruits* narrowly ellipsoid, 8–9 × 4–5 mm, red.

Habitat, distribution, and phenology. *Hoffmannia turrialbana* is known from premontane forests at 750–1400 m on the Caribbean slopes of central Costa Rica; it has been collected in flower in May and July and in fruit in February and June.

IUCN Red List category. *Hoffmannia turrialbana* meets the geographic range criterion for Critically Endangered based on its limited EOO and its limited AOO, but only qualifies as Endangered due to its more than one but not more than five locations (i.e., different threat regimes). *Hoffmannia turrialbana* is known from one legally protected area, and is apparently restricted to a relatively narrow elevational zone. One or more of its known locations are certainly in habitat decline. Therefore this species is considered Endangered due to limited geographic range and habitat decline (EN B1ab[iii]+2ab[iii]).

Discussion. *Hoffmannia turrialbana* can be recognized by the combination of its obovate or oblanceolate leaves that are subsessile, abruptly truncate to cordulate at the base, and with the tertiary venation that is not or sparsely visible; its few-flowered inflorescences; its corollas with the tube significantly longer than the lobes; and its narrow, rather elongated fruits. This new species is so far only known from the region of Turrialba; the specific epithet refers to this locality.

Hoffmannia turrialbana is similar in general aspect to *H. amplexifolia* Standl. and *H. subauriculata*, which are both also found in the same general region on the Caribbean slopes of central Costa Rica; however, those two previously described species can be separated by their leaves with nine to 13 pairs of secondary veins and their corollas with the lobes significantly longer than the tube. This new species is also similar to *H. pittieri* Standl., which is also known from this same general region on the Caribbean slopes of central Costa Rica and has similar corollas; however, *H. pittieri* can be separated by its well-developed petioles, its leaves that are obtuse to acute at the base and have nine to 13 pairs of secondary veins, its inflorescences with usually more than five flowers, and its ovaries and fruits that are broadly ellipsoid to subglobose in shape.

Paratypes. COSTA RICA. **Cartago:** along Camino Raiz de Hule, SE of Platanillo (Tsipiri), *T. Croat 36815* (MO); 16 km SE of Turrialba, camino a Puerto Limón, *O. Téllez, H. Brailowski & E. Barrera 5309* (MEXU, MO); a la entrada de Chataría, carr. entre Turrialba & Siquirres, *J. Gómez-Laurito 6775* (CR).

14. **Hoffmannia veraguensis** C. M. Taylor, sp. nov. TYPE: Panama. Veraguas: Guabal (Río Dos Bocas) ca. 16 km NW of Santa Fé, ca. 500 m, 15–16 Nov. 1972, *R. L. Dressler 4790* (holotype, MO-2288680). Figure 5C, D.

Haec species a *Hoffmannia formicaria* C. M. Taylor lobis calycinis brevioribus glabrescentibus atque corolla minore distinguitur.

Herbs or subshrubs to 0.6(−1) m tall, unbranched, often weak and extensively rooting near base; stems densely villous or hirsute-tomentose. *Leaves* opposite; *petiole* (i.e., below vesicles) 3–10 mm; *blade* elliptic, obovate, or obovate-oblong, 8–20 × 5–10 cm, adaxially moderately to rather densely hispid or hirsute, abaxially hispidulous to hirtellous or hirsute with pubescence denser along veins, drying papery, base cuneate to rounded then with a pair of narrowly ellipsoid or ellipsoid-oblong vesicles 1–2.2 × 0.5–1 cm, apex rather abruptly and shortly acuminate; secondary veins 8 to 12 pairs, free or with a few pairs weakly looping to interconnect, tertiary venation well developed; *stipules* narrowly triangular to narrowly ligulate, 3–5 mm, succulent, densely hirsute, obtuse to acute or apparently shortly 2-dentate, deciduous. *Inflorescences* produced with leaves, cincinnate to helicoid, 2.5–7.5 cm, densely hirsute or villous, 5- to 30-flowered; peduncles 1 per axil, 1–4 cm; bracts reduced; pedicels 1–5 mm. *Flowers* pedicellate; ovary slenderly ellipsoid, ca. 2 mm, hirsute; *calyx* limb lobed nearly to base, lobes narrowly triangular to linear, 1.2–4 mm, hirsute; *corolla* white or cream sometimes flushed and/or striped with brown, brownish red, or green, rotate, externally glabrescent to sparsely hirsute at least in apical portion, tube 3–4 mm, lobes narrowly triangular, 3.5–5 mm, acute to obtuse; anthers ca. 3 mm; stigmas not seen. *Fruits* subglobose, ca. 6 mm diam., red.

Habitat, distribution, and phenology. *Hoffmannia veraguensis* is known from wet and premontane forests at 500–1000 m on the Pacific slopes of west-central Panama; it has been collected in flower July through September and in November and in fruit November through January.

IUCN Red List category. *Hoffmannia veraguensis* meets the geographic range criterion for Endangered based on its limited EOO, its limited AOO, and its no more than five locations. This species is found in two legally protected areas, and overall is known from a small geographic region. Some of its locations may be reasonably well preserved and protected, but the threat to its habitat is widespread and relatively uniform at least outside the protected areas. This species is considered Endangered due to limited geographic range and habitat decline (EN B1ab[iii]+2ab[iii]).

Discussion. *Hoffmannia veraguensis* can be recognized by its low habit, villous or hirsute-tomentose pubescence, shortly petiolate leaves of moderate size with paired vesicles at the base, well-developed calyx lobes, and corollas with the lobes slightly longer than the lobes. This new species is similar to *H. formicaria* and appears to replace that species in west-central Panama; the specific epithet refers to its range, which is best documented in Veraguas.

This new species is quite similar to *Hoffmannia formicaria*, which is described previously in this article; but *H. veraguensis* can be recognized by its shorter calyx lobes, usually more slender and prolonged inflorescences, and mostly smaller corollas.

Paratypes. PANAMA. **Coclé:** N of El Copé, Río Corazón, Caribbean slope, W of main trail to Limón, *R. Dressler 5990* (MO). **Veraguas:** vic. of Escuela Agricultura Alto Piedras near Santa Fé, along trail to top of Cerro Tute, *T. Antonio 2926* (MO); valley of Río Dos Bocas on rd. to Calovebora, *T. Croat 27502* (MO); on slopes of Cerro Tute, Parque Nac. Cerro Tute, *T. Croat & G. Zhu 76903* (MO), *S. Mori, A. Bolten & R. Dressler 7534* (MO); mtns. W of Siclo Básico school, *B. Hammel 4654* (MO); slopes & peak of Cerro Arizona, *B. Hammel 4703* (MO); along Río Dos Bocas, *S. Mori & J. Kallunki 3144* (MO); 8.8 km from Escuela Agrícola, *S. Mori & J. Kallunki 4014* (MO); trail from Bajo Chitra to Río Gatú, Pacific slope, *G. De Nevers & G. McPherson 6768* (MO).

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